

THE BURDEN OF ASTHMA IN RHODE ISLAND

2009



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February 2009

Dear Rhode Islanders,

It is with great pleasure that I present to you *The Burden of Asthma in Rhode Island, 2009*, the fourth in a series of data reports on asthma in Rhode Island. Population-based data are provided on asthma prevalence, quality of life, health care use, and morbidity. Asthma does not affect all groups equally, therefore, several years of data prior to 2008 were combined when possible to identify asthma disparities based on race and ethnicity, income, and geography.

Comprehensive, current data are critical to the Rhode Island Department of Health and our partners in defining goals and objectives to assist us in our commitment to reducing the burden of asthma, and targeting populations to reduce disparities. This information is equally important for the evaluation of our objectives and activities in reaching these goals. We hope that you find this information useful and thought provoking as we work together to improve the lives of people with asthma.

Sincerely,

A handwritten signature in black ink, appearing to read "David R. Gifford", is written over a horizontal line.

David R. Gifford, MD, MPH
Director of Health



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EXECUTIVE SUMMARY

Asthma is one of the most common chronic diseases in the US, affecting people of all ages. In the US, an estimated 23 million people are known to have asthma. Nearly 6 million of those with asthma are children.

The Rhode Island Department of Health Asthma Control Program has established an asthma surveillance system to better understand and describe the burden of asthma in Rhode Island. The development of this burden report was done simultaneously with the development of a second document *Reducing the Burden of Asthma in Rhode Island: Asthma State Plan, 2009–2014 (Asthma State Plan)*. Data

tracking various aspects of asthma—asthma prevalence, visits to the hospital and the emergency department (ED), quality of life, and mortality—were critical to the completion of the goals and objectives in the *Asthma State Plan*, and for planning policy and programmatic interventions to reduce the burden of asthma in the Rhode Island population.

The purpose of this report is to describe the prevalence of asthma and asthma-related health outcomes in Rhode Island using the most recent data available. *The Burden of Asthma in Rhode Island, 2009* is an updated version of two earlier publications on the burden of asthma in Rhode Island, published in 2004 and 2007, respectively.

Data for this report come from the Rhode Island Behavioral Risk Factor Surveillance System (BRFSS), the Rhode Island Youth Risk Behavior Survey (YRBS), the Rhode Island Hospital Discharge Data, the Rhode Island Emergency Department Data, and Rhode Island Vital Records. Data on asthma in children come from the Random Child Selection and the Child Asthma Prevalence Modules included in 2005–2007 BRFSS.

BRFSS Adult Asthma Module was used to provide additional information on asthma symptoms, asthma prescription usage, and physician office visits for adults with asthma. This updated report also includes new information on asthma quality of life from Neighborhood Health Plan of Rhode Island, a statewide managed care organization. This report focuses on Neighborhood Health Plan of Rhode Island because this health plan serves approximately 60% of the state's Medicaid population.

Overall, the prevalence of current asthma is slightly higher in Rhode Island compared to the national average. Data from the 2006 National Health Interview Survey (NHIS) show that 9.3% of children (0 to 17 years of age) and 7.3% of adults (18+) currently had asthma.¹ However, the most recent population-based data for Rhode Island show that, in 2007, 13% of children under age 18 years and nearly 10% of adults aged 18 and older had asthma.

Asthma is a chronic respiratory disease that causes a person's airways or windpipes to narrow, resulting in symptoms including difficulty breathing, wheezing, shortness of breath, chest tightness, and coughing. If left untreated, asthma can cause permanent lung damage, disability, and even death.

Both nationally and in Rhode Island, current asthma prevalence among adults aged 18 and older is slightly higher, but not significantly different, among non-Hispanic whites, non-Hispanic blacks, and Hispanics. Nonetheless, within certain subgroups of the population, there are areas of concern. Among Rhode Island adults, the prevalence of current asthma is higher in:

- Women than men,
- Adults aged 18 to 64 than adults over the age of 65,
- Adults with less than 12 years of education compared to adults with more years of formal schooling, and
- Adults with household incomes below \$25,000 compared to adults with higher household incomes

Experts are unsure of why asthma is so prevalent in low-income areas, but many attribute it to excessive exposure to environmental pollution and substandard housing, which increase the risk of exposure to indoor asthma irritants.

Experts are, to a certain extent, unsure of why asthma is so prevalent in low-income areas, but many attribute it to excessive exposure to environmental pollution and substandard housing, which increase the risk of exposure to indoor asthma irritants (e.g., dust mites, cockroach allergen). Low-income households also may not have access to proper preventive care.

Among Rhode Island children, current asthma rates are higher in the 5-to-14 year age group (14.2%) than for 0 to 4 year olds (9.2%). This is similar to national data where 5.8% of children under age 5 and 10.9% of children aged 5 to 14 currently have asthma.¹

Hospitalization rates are not indicators of asthma prevalence. However, hospitalization rates can be used as proxy measures for the severity of the disease in the population, and how well individual cases are being managed by families and the health care system. Over the last eight years, the rate of asthma hospitalizations in Rhode Island has slowly increased from 11.6 per 10,000 Rhode Islanders in 2000 to 14.6 per 10,000 Rhode Islanders in 2007. These rates are below national hospitalization rates for asthma. The most current nationally representative data on inpatient care in the US shows that, in 2005, the hospitalization rate for asthma was 16.6 per 10,000 population.² Despite the fact that hospitalization rates are the “tip of the iceberg”—most people with asthma do not need to be hospitalized for their asthma—asthma hospitalization rates are one way to assess the burden of asthma among demographic groups within the state.

In 2007, the Rhode Island asthma hospitalization rate for children under 5 was four times higher than the hospitalization rate for asthma among all other children (48.4% vs. 11.5%). Among Rhode Island adults, there are substantial disparities in the hospitalization rates for asthma by race/ethnicity. Between 2000 and 2007, age-adjusted asthma hospitalization rates among non-Hispanic blacks rose from a low of 29.4 per 10,000 in 2000–2001 to a high of 35.6 per 10,000 in 2006–2007. The asthma hospitalization rates for non-Hispanic blacks were higher than age-adjusted asthma hospitalization rates for Hispanics and non-Hispanic whites, despite these latter groups also experiencing rising hospitalization rates between 2001–2002 and 2006–2007. Non-Hispanic blacks are hospitalized at nearly twice the rate of Hispanics (35.6 vs. 22.3 hospitalizations per 10,000 population), and have a 2.8 times higher rate of hospitalizations for asthma than non-Hispanic whites

(35.6 vs. 12.8 hospitalizations per 10,000 population). Poverty, greater exposure to environmental asthma triggers, and/or a lack of access to care may play a role in these intergroup differences in asthma hospitalization rates.

Most significantly, there are large disparities in asthma hospitalization rates between those who live in the city of Providence and those who live in the rest of the state. The age-adjusted asthma hospitalization rate for Providence is nearly twice that for the state as a whole (Providence: 18.9 per 10,000 vs. Rhode Island: 10.6 per 10,000). These findings are not surprising. Although it is possible that there are genetic propensities in asthma in children among different racial and ethnic groups, most evidence points to poverty as an important cause of disease severity in most chronic diseases. Providence is the most populous city in the state with the highest percentage of minority residents (non-Hispanic whites comprise 45.8% of the population), and a poverty rate that is among the 10 highest for cities over 100,000 (> 30%).³

Asthma mortality rates are low in Rhode Island. Where asthma was the underlying cause of death, the average annual age-adjusted mortality rate was 11.8 per 1,000,000 residents (2000–2006). Among Rhode Island children, asthma deaths are rare. Nationally, the death rate from chronic lower respiratory diseases, which includes asthma, is 4.7 per 1,000,000 residents (2005).⁴

While the current report demonstrates that much can be learned about asthma in Rhode Island, the picture remains incomplete. A major gap is the lack of data on asthma-related outcomes at the neighborhood level. As noted above, neighborhood factors, such as concentrated economic disadvantage, residential instability, and above average exposure to environmental toxins, likely help determine asthma prevalence and related outcomes. Thus, to reduce disparities in asthma morbidity and mortality, Rhode Island's Asthma Control Program is working with many partners to implement and evaluate interventions that focus both on individuals and the health-enhancing aspects of communities.



KEY FINDINGS

Who has Asthma?

Adults

- Approximately 15% of Rhode Island adults have been diagnosed with asthma at some point in their lifetime, representing an estimated 124,608 Rhode Island adults.
- Ten percent of Rhode Island adults currently have asthma, representing an estimated 83,448 Rhode Island adults.
- Over a seven-year period, Rhode Island saw a 1% increase in asthma prevalence among adults (8.5% to 9.9%).

There are distinct disparities in adult asthma according to key demographic features.

- **Sex.** Current asthma rates are *significantly higher* among women than men.
- **Age.** The prevalence of current asthma is *significantly higher* in adults aged 18 to 64 than in adults ages 65 and older.
- **Education.** Current adult asthma rates are *significantly higher* among those with less than 12 years of education than adults with a high school diploma or more years of formal schooling.
- **Income.** Current asthma prevalence is *significantly higher* among adults with household incomes below \$25,000 than adults with higher household incomes.
- **Race.** The prevalence of current asthma is *significantly higher* among non-Hispanic white and non-Hispanic black adults than Hispanic adults.

Children

- An estimated 17% of Rhode Island children have been diagnosed with asthma at some point in their lifetime—about 39,000 children.
- Eleven percent of Rhode Island children currently have asthma—about 27,000 children
- Between 2005 and 2007, Rhode Island saw a 2% increase in asthma prevalence among children.

There are distinct disparities in childhood asthma according to key demographic features.

- **Age.** Current asthma rates are *significantly higher* among children in the 12-to-17 year age group than children 0 to 4 years of age.
- **Sex and age.** Current asthma prevalence is *significantly higher* among boys aged 12 to 17 than it is among boys and girls 0 to 11 years of age. Among children aged 12 to 17 years, the prevalence of asthma was not significantly higher for boys than girls (Boys 12–17 years: 15.6%; Girls 12–17 years: 12.0%).

What is the Quality of Life and Health Care Use for Adults with Asthma?

- An estimated 46% of Rhode Island adults with asthma reported having an asthma attack in the past year.
- Among Rhode Island adults with current asthma, a *significantly higher* percentage of low-income adults than higher-income adults reported asthma symptoms most days of the week or daily and used rescue medications to stop an asthma attack five or more times in the past 30 days.

- Forty percent of Rhode Island adults with current asthma reported that asthma interrupted their sleep at night on one or more days of the past month.
- Fifteen percent of Rhode Island adults reported one to seven days of limited activity in the past year due to asthma, and 22% reported eight or more days of limited activity in the past year due to asthma.
- Among Rhode Island adults with current asthma, 27% reported that they had one or more urgent care visits in the past year because their asthma was getting worse; 17% reported that they had one or more asthma-related ED visits in the past year.
- Only 34% of Rhode Island adults indicated they had ever received an asthma management plan from a doctor or other health care professional.

Who is Hospitalized for Asthma?

- From 2000 to 2007, the rate of asthma hospitalizations has slowly increased from 11.6 per 10,000 Rhode Islanders in 2000 to 14.6 per 10,000 Rhode Islanders in 2007; however, these rates were below national hospitalization rates for asthma.
- About 89% of admissions for pediatric asthma and 92% of admissions for adult asthma were through the emergency room.
- Age-adjusted asthma hospitalization rates for Hispanics and non-Hispanic whites also rose between 2001–2002 and 2006–2007, but the hospitalization rates for non-Hispanic blacks remained consistently higher than that of Hispanics and non-Hispanic whites.
- Between 2000 to 2007, the age-specific asthma hospitalization rate was higher for non-Hispanic black children than non-Hispanic white children or Hispanic children.
- Among adults aged 65 and older, the age-specific asthma hospitalization rate doubled over eight years, from 10.8 in 2000 to 21.3 in 2007.
- Children aged 0 to 4 years have *significantly higher* asthma hospitalization rates than all other age groups.
- Boys are more likely to be hospitalized for asthma than girls, while women are more likely to be hospitalized for asthma than men.
- The average stay for a hospitalization for asthma is about two days for children and three days for adults. Average charges per hospitalization for asthma are approximately \$7,840 for children and \$12,977 for adults.
- The asthma ED rate for all ages in Rhode Island in 2007 was 54.9 per 10,000. This rate is only slightly higher than the Healthy People 2010 target goal of 50.0 per 10,000 individuals for asthma ED visits for ages 5 to 64.

Who Dies from Asthma?

- Between 2000 and 2007, there was an average of 10 deaths per year in Rhode Island for which asthma was the principal cause of death and an average of 43 deaths per year where asthma was listed as a contributing cause of mortality.
- The average mortality rate where asthma was the underlying cause of death was 11.7 deaths per one million Rhode Island adults aged 18 and older.
- The average mortality rate where asthma was the contributing cause of death was 51.1 deaths per one million Rhode Island adults aged 18 and older.

FIGURE 1. MAP OF RHODE ISLAND

■ Core City ■ Non-Core City



Note: Core cities in Rhode Island are defined as any city where the child poverty level is greater than 15%.
Source: Rhode Island Department of Labor and Training. Available at: www.dlt.ri.gov/lmi/maps/county.htm

INTRODUCTION

Rhode Island is the smallest state of the union; it is only 37 miles wide and 48 miles long. It is one of the most densely populated and heavily industrialized states for its size (See Figure 1).

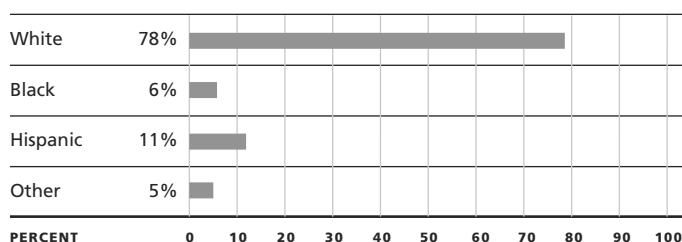
About Rhode Island

In 2007, Rhode Island's estimated resident population was 1,057,832; approximately 78% of the state's population is non-Hispanic white, 6% is non-Hispanic black/African-American, and 11% is of Hispanic/Latino origin (See Figure 2).

Poverty rates vary substantially by race/ethnicity both nationally and in this state (Figure 3). In Rhode Island, blacks are twice as likely to be poor as whites and Hispanics are more than three times as likely to be poor as whites. Most of Rhode Island's poor and minority residents live in one of Rhode Island's core cities. Rhode Island defines a core city as any city where the child poverty level is greater than 15%, according to the 2000 Census. These cities include: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket (shown in black on the map at left).

Most of Rhode Island's poor and minority residents live in one of Rhode Island's core cities. Rhode Island defines a core city as any city where the child poverty level is greater than 15%.

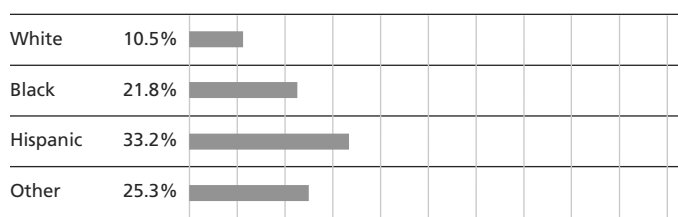
FIGURE 2. POPULATION DISTRIBUTION BY RACE/ETHNICITY,¹ RHODE ISLAND, 2006–2007



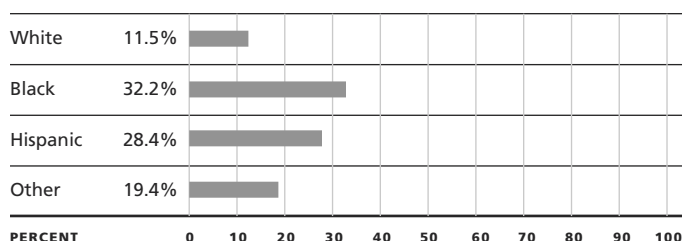
¹ Race/ethnicity: Persons of Hispanic origin may be of any race; all other racial/ethnic groups are non-Hispanic. "Other" includes Asian Americans, Pacific Islanders, American Indians, Aleutians, Eskimos and persons of "Two or More Races." These groups are combined due to their small populations, which prevent meaningful statistical analyses of the groups individually.

Data source: US Census Bureau State and County QuickFacts, Rhode Island 2006. Available at: <http://quickfacts.census.gov/qfd/states/44000.html> and Henry J. Kaiser Family Foundation State Health Facts. Available at: <http://www.statehealthfacts.org/profileind.jsp?cat=9&sub=106&rgn=41>

FIGURE 3. POVERTY BY RACE/ETHNICITY,¹ RHODE ISLAND, 2006–2007



UNITED STATES, 2007



¹ Race/ethnicity. See Figure 2.

Data source: Urban Institute and Kaiser Commission on Medicaid and the Uninsured estimates based on the Census Bureau's March 2007 and 2008 Current Population Survey (CPS: Annual Social and Economic Supplements). Available at: <http://www.statehealthfacts.org/profileind.jsp?ind=14&cat=1&rgn=41>

What is Asthma?

Asthma is a chronic respiratory disease that causes a person's airways to narrow, resulting in difficult breathing, including wheezing, shortness of breath, chest tightness, and coughing.⁵ If left untreated, asthma can cause permanent lung damage, disability, and even death. An asthma attack occurs when a person with asthma has greater difficulty breathing than their normal level and requires increased medication. Asthma attacks are also known as asthma flare-ups, asthma episodes, or asthma exacerbations.

No one knows exactly what causes asthma. It is thought to be a combination of environmental and genetic (hereditary) factors. Risk factors shown to increase the risk of developing asthma and having more severe disease once the disease develops include:⁵

- A family history of asthma
- Frequent respiratory infections as a child
- Exposure to secondhand smoke
- Exposure to indoor and outdoor allergens (e.g. house dust mites, pet dander, airborne pollens, mildew, mold spores, high levels of air pollution)
- Exposure to occupational triggers, such as chemicals used in manufacturing
- Low birth weight
- Being overweight

There is no cure for asthma, but the condition can usually be managed and attacks can be prevented. Asthma is treated in two ways: by avoiding potential triggers and with medication. Asthma medications fall into two categories: 1) rescue medications and 2) controller medications. Rescue medications prevent asthma exacerbations (e.g., decline in lung function and/or increase in asthma symptoms). They are also known as “reliever,” “quick-relief,” or “fast-acting” medications. Controller medications manage asthma and prevent symptoms from occurring from the outset. Controller medications (also called “preventive” or “maintenance” medications) treat the problem of airway inflammation instead of the symptoms (coughing, wheezing, etc.) that it causes. Controller medications are slow acting and can take days or even weeks to begin working. These medications minimize any permanent lung changes that may be associated with having asthma.

How Big is the Problem of Asthma in the Nation?

The prevalence of asthma in the US is higher than in many other countries in the world. Today, asthma is one of the most common chronic diseases in the US, as well as one with a serious public health impact. In 2006, an estimated 23 million Americans had asthma, including over 6.8 million children under 18 years of age. About 12.4 million people with asthma had an asthma attack in 2006; about 4.1 million were children with asthma.⁶ The Pew Environmental Health Commission estimates that by 2020, 29 million Americans will suffer from asthma.⁷

Who is Most Affected by Asthma?

Asthma does not affect all groups equally. In early childhood, asthma is more common in boys than in girls, but this pattern is reversed among adults, where more women than men

have asthma. Blacks suffer disproportionately from asthma. For blacks in the US, asthma prevalence rates are almost 24% higher (94.2 per 1,000) than for whites (76.1 per 1,000).⁸ Compared with non-Hispanic whites, non-Hispanic blacks experience greater asthma morbidity, including higher emergency room visits, hospitalizations, and reduced access to asthma-related health care services.⁹ In Rhode Island, non-Hispanic blacks have consistently higher hospitalization rates for asthma compared to non-Hispanic whites and Hispanics.

Residents in Rhode Island's core cities have hospitalization rates for asthma that are higher than those for the state as a whole. Core city residents are much more likely than non-core city residents to be without insurance coverage of any type over an entire year. In 2001, 12.3% of core city residents were uninsured as compared with 5.7% of residents living in non-core cities.¹⁰

What are the Costs of Asthma to the Nation?

Throughout the country, asthma imposes a growing burden on society in terms of health care utilization, costs, and quality of life. In 2005, there were 12.8 million physician office visits, 1.3 million hospital outpatient department visits, and almost 1.8 million emergency room visits due to asthma.⁶

Asthma is the third leading cause of hospitalization among children under the age of 15. In 2005, approximately one-third (32.6%) of hospitalizations due to asthma were in those under age 15; however, only one-fourth of the US population was younger than 15 years of age.⁶

Estimates of direct medical expenditures and indirect costs (in 2007 dollars) attributed to asthma are \$19.7 billion; about \$14.7 billion in direct health care costs and \$5 billion in indirect costs (e.g. lost productivity).⁶ Lost productivity due to missed work days and missed school days are major contributors to the burden of asthma on the health care system.

Can Asthma Symptoms be Controlled?

Asthma is a complex chronic disease with varying symptoms and severity that requires many levels of health care. Although there is no cure for asthma, there are many things a person can do to manage her/his asthma and keep symptoms to a minimum. In 2007, the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health, and the National Asthma Education and Prevention Program (NAEPP) issued updated clinical guidelines for the diagnosis, treatment, and management of asthma by physicians.¹¹ The new NAEPP guidelines place less emphasis on the classification of asthma by level of severity and more emphasis on a physician-patient partnership to control asthma symptoms.

Asthma – A National Priority and a Rhode Island Priority

The US Department of Health and Human Services (USDHHS) has recognized asthma as a public health priority in its Healthy People 2010 national health plan. Rhode Island, like most other states, has adopted the Healthy People 2010 agenda. *Healthier Rhode Island by 2010: A Plan for Action* is the state's blueprint for meeting Healthy People 2010 objectives for Rhode Island.¹³ The two overarching goals in Rhode Island's plan are to: (1) increase quality of life and (2) eliminate disparities. The Rhode Island Asthma Control Coalition

and the Rhode Island Department of Health’s Asthma Control Program are committed to securing a high measure of quality of life for all Rhode Islanders who have asthma and eliminating disparities in asthma-related health outcomes.

Rhode Island Asthma Surveillance System

The two overarching goals in the Healthier Rhode Island by 2010: A Plan for Action are to increase quality of life and eliminate disparities.

In efforts funded by the Centers for Disease Control and Prevention (CDC), the Rhode Island Department of Health’s Asthma Control Program seeks to comprehensively address the burden of asthma through surveillance, partnerships, and interventions. The data sets shown in Table 1 are used in this report. The Rhode Island Department of Health’s Center for Health Data and Analysis oversees and maintains these databases.¹⁴ *Measuring Asthma in Rhode Island: Data Inventory* provides detailed information on the datasets in the Rhode Island Asthma Surveillance System. This document is available at www.health.ri.gov.

TABLE 1. RHODE ISLAND ASTHMA SURVEILLANCE SYSTEM

DATA SETS	POPULATION
Behavioral Risk Factor Surveillance System (BRFSS)	State-wide random sample of adults (18+)
Youth Risk Behavior Survey (YRBS)	Random sample of Rhode Island public high school and middle school students (Grades 6–12)
Hospital Discharge Data	Rhode Island residents hospitalized in the state
Emergency Department Data	Rhode Island residents with an emergency room visit in the state
Vital Records (Death data)	Rhode Island residents who die in or out of state

Data Source: Rhode Island Department of Health, Center for Health Data and Analysis.

The Purpose of this Report is Twofold:

- 1. To provide a comprehensive review of asthma prevalence, hospitalizations, and deaths;
- 2. To provide access to timely, comprehensive, and accurate asthma data for the lay public, program planners, health care providers, and policy makers in a format for public use.

Why is a Burden of Asthma Report in Rhode Island Needed?

This report provides the fullest understanding of the burden of asthma in Rhode Island. The Rhode Island Department of Health and the Rhode Island Asthma Control Coalition developed the *Asthma State Plan* simultaneously with the development of this report. The plan will be released by March 2009 and will be available at www.health.ri.gov. It is a blueprint for addressing asthma as a public health priority with data-driven goals, objectives, and activities recommended for statewide action to reduce the burden of asthma in the state.

Tracking Disparities

The Rhode Island Asthma Surveillance System provides timely and relevant data for identifying racial/ethnic and other disparities in asthma prevalence and asthma-related outcomes. Groups used to measure potential disparities in health status and health

TABLE 2. MEASURING DISPARITIES IN ASTHMA PREVALENCE AND ASTHMA-RELATED OUTCOMES

AGE	DISPARITY	DEFINITIONS
Adults 18+	Sex	Female vs. Male
	Age group	18–64 vs. 65+
	Educational level	Less than 12 years vs. High school diploma or more years of formal schooling
	Household income	Less than \$25,000 per year vs. \$25,000+
	Race/ethnicity ¹	Hispanic, black non-Hispanic, white non-Hispanic, other racial/ethnic groups
Children 0–17 Years	Sex	Female vs. Male
	Age group	0–4, 5–11, 12–17
Middle and High School Students	Sex	Female vs. Male
	Age group	Middle school: 11 or younger, 12, 13, 14 or older; High school: 15 or younger, 16 or 17, 18 or older
	Educational level	Middle school: 6th, 7th, 8th; High school: 9th, 10th, 11th, 12th
	Race/ethnicity ¹	Hispanic, black non-Hispanic, white non-Hispanic, other racial/ethnic groups

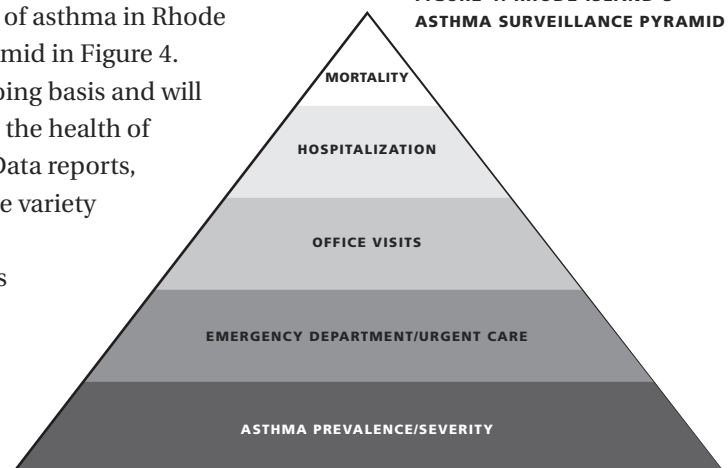
¹ Race/ethnicity. Persons of Hispanic origin may be of any race; all other racial/ethnic groups are non-Hispanic. "Other" includes Asian Americans and American Indians.

outcomes are shown in Table 2. Whenever possible, this report combines several years of data to ensure sufficient sample sizes for small populations so meaningful statistical analyses of these groups is possible.

However, many Rhode Island Department of Health data sets have small samples of racial and ethnic minority groups. Since many racial and ethnic differences can be explained by socioeconomic differences, this report often focuses on socioeconomic differences rather than racial and ethnic differences. In Rhode Island, blacks are twice as likely to be poor as whites, and Hispanics are more than three times as likely to be poor as whites. A household income of less than \$25,000 was used as a marker of low income. Many social services in Rhode Island use a cutoff of \$25,000 in annual household income as a measure of need, a category often referred to as "low income" or "near-poor."

The Rhode Island Department of Health's Asthma Control Program continually monitors the quality of its surveillance system and strives to add new databases to assess the burden of asthma in Rhode Island, as depicted in the surveillance pyramid in Figure 4.

This report will be updated on an ongoing basis and will be used to measure progress on improving the health of individuals with asthma in Rhode Island. Data reports, such as this one, are disseminated to a wide variety of stakeholders to inform the planning, implementation, and evaluation of policies and programs to improve asthma outcomes statewide.

FIGURE 4. RHODE ISLAND'S ASTHMA SURVEILLANCE PYRAMID

Data Source: Centers for Disease Control and Prevention. "A Public Health Response to Asthma" PHTN Satellite Broadcast Course Materials, 2001.



GUIDE TO READING THIS REPORT

Terms, Definitions, and Statistical Methods

Prevalence. How do we measure the burden of disease or health-related events in the population? To answer this question we estimate how many people have a specific disease or health-related event at a given point in time out of the entire population.

Asthma is a chronic respiratory disease that causes a person's airways to narrow, resulting in symptoms including difficulty breathing, wheezing, shortness of breath, chest tightness, and coughing. If left untreated, asthma can cause permanent lung damage, disability, and even death.

Statistical significance and 95% confidence intervals

(95% CI). How do we know if one group is significantly different from another group with respect to the burden of disease or health-related event? One way of determining significant differences across groups is to compute a 95% confidence interval (95% CI). Since all values in a survey are estimates, the 95% confidence interval (95% CI) is the range of values within which the “true” value probably lies 95% of the time. When two groups have 95% confidence intervals that overlap, indicating that the “true” value could potentially be the same in both groups, the groups are conservatively assumed to have statistically similar rates. If the confidence intervals do not overlap, we assume that the groups being compared are significantly different from one another. A narrow confidence interval implies high precision; while a wide interval implies poor precision. Determination of statistical significance for data in this report is based on non-overlapping 95% confidence intervals. Although this is not strictly speaking a statistical test, it is a commonly accepted way to compare estimates.

Displaying disparities.

This report displays findings on disparities in table format to show when the 95% confidence intervals do and do not overlap. In the example in Table 3, current asthma rates are *significantly higher* among adult women than adult men but not among boys and girls.

TABLE 3. DISPARITIES IN CURRENT ASTHMA PREVALENCE BY SEX, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007

POPULATION GROUPS	BRFSS SAMPLE	ASTHMA SAMPLE	
		Sample size, n ¹	Percentage (95% CI) ²
Total adults (18+)	12,990	1,384	10.3 (9.6 – 11.1)
Women	8,276	1,065	13.2 (12.2 – 14.2)
Men	4,714	319	7.2 (6.2 – 8.2)
Total children (0–17)	3,91	424	11.3 (10.1 – 12.5)
Girls	1,765	183	10.1 (8.4 – 11.9)
Boys	1,926	241	12.6 (10.9 – 14.4)

¹ Sample of respondents with a “yes” response to the question about current asthma.

² Weighted data.

Data Source: 2005–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file (File 1: Adults. File 2: Children), Rhode Island Department of Health, Center for Health Data and Analysis.



WHO HAS ASTHMA?

An estimated 110,448 people in Rhode Island currently have asthma. This represents 10% of the state's population.

ASTHMA IN ADULTS

Measuring Adult Asthma Prevalence

There are many challenges in conducting asthma surveillance. Both prevalence and mortality from asthma appear to have increased in many parts of the world during a time when better asthma medications have been available to more patients suffering from asthma.¹⁵ Several methods can be used to measure asthma prevalence in the US. One way to assess the prevalence of asthma is to identify persons with a diagnosis of asthma by a doctor, nurse, or other health professional. Another way to define asthma prevalence is to identify anyone with asthma-like symptoms. Wheezing, difficulty breathing, pain or tightening in the chest, and coughing are common signs and symptoms of asthma. Wheezing is a classic sign of asthma in children. However, not all children who have wheezing episodes will develop asthma, and not all children with asthma wheeze. Different definitions of asthma make it difficult to determine the absolute number or prevalence of people living with asthma at any one time. In addition, unlike many infectious and chronic diseases, there are no registries that track the number of individuals living with asthma.

One available method for determining the prevalence of asthma is through health surveys. Rhode Island tracks adult asthma prevalence using the Behavioral Risk Factor Surveillance System (BRFSS). This state-based, random-digit-dialed telephone survey of the non-institutionalized, civilian, adult (18 and over) population is cooperatively administered by CDC, the 50 states, the District of Columbia, and three US territories. Once a household is selected, one adult (aged 18 or older) is randomly selected to be interviewed. BRFSS data are weighted to provide national- and state-level estimates of health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury.¹⁶

Asthma prevalence for adults is calculated using self-reported data collected through the Behavioral Risk Factor Surveillance System (BRFSS), a state-based, random-digit-dialed telephone survey.

As described above, BRFSS is one of our most important surveys. It is the longest running population-based health survey in the world. The adult sample in Rhode Island BRFSS has increased over the past eight years from 3,544 respondents aged 18 and older in 2000 to 4,499 respondents age 18 years and older. Overall, about 53% of respondents are women, 19% are 65 years of age or older, and 85% are white.

BRFSS gathers information on the prevalence of asthma using two core questions. Lifetime and current asthma (see Table 4) prevalence in adults distinguish between (a) individuals who have been diagnosed with asthma at some point in their lifetime but do not feel they currently have asthma, and (b) those who currently have asthma.

Trends in Adult Asthma Prevalence

Lifetime adult asthma rates remain consistently higher in Rhode Island than in the rest of the country. There also has been an upward trend in lifetime adult asthma rates in Rhode Island. The percentage of Rhode Island adults ever diagnosed with asthma was significantly higher in the years 2003 to 2007 than in 2000. (See Figure 5: Lifetime prevalence in 2000: 11.7, 95% CI = 10.5 – 12.9; Lifetime prevalence in 2007: 14.7, 95% CI = 13.2 – 16.3).

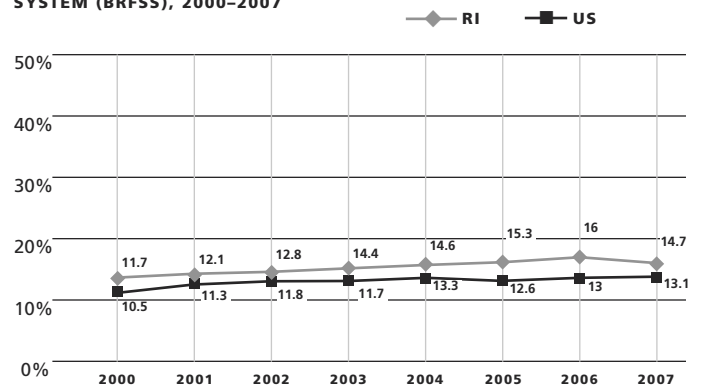
Current adult asthma rates remain slightly higher in Rhode Island than in the rest of the country. Nonetheless, current asthma rates in Rhode Island adults have remained stable over time with no significant differences from one year to the next (see Figure 6).

Current adult asthma rates remain slightly higher in Rhode Island than in the rest of the country. Nonetheless, current asthma rates in Rhode Island adults have remained stable over time with no significant differences from one year to the next.

TABLE 4. LIFETIME AND CURRENT ADULT ASTHMA PREVALENCE QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

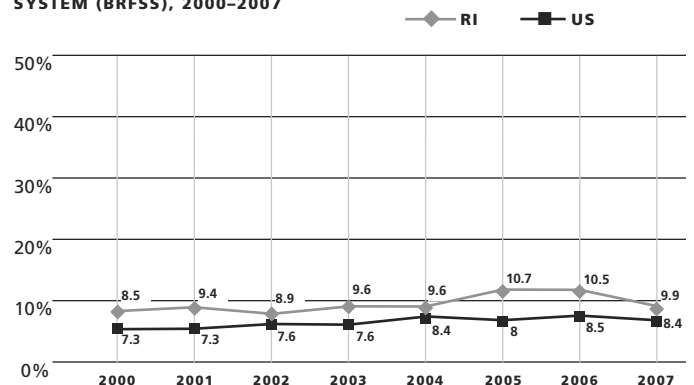
Lifetime asthma prevalence	Have you ever been told by a doctor, nurse, or other health professional that you have asthma?
Current asthma prevalence	Do you still have asthma?

FIGURE 5. TRENDS IN LIFETIME ADULT ASTHMA PREVALENCE BY YEAR, US AND RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2000–2007



Data Source: 2000–2007 National and Rhode Island Behavioral Risk Factor Surveillance System.

FIGURE 6. TRENDS IN CURRENT ADULT ASTHMA PREVALENCE BY YEAR, US AND RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2000–2007



Data Source: 2000–2007 National and Rhode Island Behavioral Risk Factor Surveillance System.

Adult Asthma Prevalence Aggregated Over Time

Trends in asthma prevalence can be tracked by looking at individual years of data or by combining several years of data. Table 5 displays the prevalence of asthma in adults based on five years of BRFSS data combined.

Based on aggregated data for five years, approximately 15% of Rhode Island adults have been diagnosed with asthma at some point in their lifetime, representing an estimated 124,608 Rhode Island adults. Ten percent of Rhode Island adults currently have asthma, representing an estimated 83,448 Rhode Island adults (see Table 5).

Disparities in Adult Asthma Prevalence

Data from 2003–2007 BRFSS combined file underscore substantial differences in current adult asthma prevalence by sex, age group, educational level, household income, and race/ethnicity. Race disparities are highlighted in Figure 7 and Table 6.

- **Sex.** Current asthma rates are *significantly higher* among women than men.
- **Age.** The prevalence of current asthma is *significantly higher* in adults aged 18 to 64 than in adults ages 65 and older.
- **Education.** Current adult asthma rates are *significantly higher* among those with less than 12 years of education than adults with a high school diploma or more years of formal schooling.
- **Income.** Current asthma prevalence is *significantly higher* among adults with household incomes below \$25,000 than adults with higher household incomes.
- **Race.** The prevalence of current asthma is *significantly higher* among non-Hispanic white and non-Hispanic black adults than Hispanic adults.

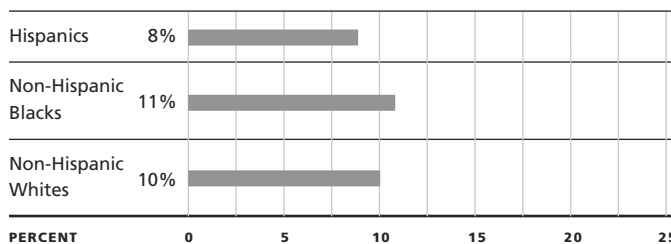
TABLE 5. ASTHMA PREVALENCE IN ADULTS AGGREGATED OVER TIME, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2003–2007 *

	BRFSS SAMPLE	LIFETIME ASTHMA% (95% CI)	CURRENT ASTHMA % (95% CI)
Adults 18+	21,042	15.0 (14.3 – 15.6)	10.1 (9.5 – 10.6)
Weighted sample	833,953	124,608	83,448

Data Source: 2003–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

* Percentages, 95% confidence intervals and corresponding sample sizes are weighted.

FIGURE 7. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA BY RACE/ETHNICITY, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2003–2007



Data Source: 2003–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

In Rhode Island, the prevalence of current asthma is *significantly higher* among non-Hispanic white and non-Hispanic black adults than Hispanic adults.

TABLE 6. DISPARITIES IN CURRENT ADULT ASTHMA PREVALENCE, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2003–2007

CHARACTERISTICS OF ADULTS (18+ YRS)		ASTHMA SAMPLE	
		UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE % (95% CI) ²
Sex	Male	7,784	6.9 (6.2 – 7.6)
	Female	13,137	12.9 (12.2 – 13.7)
Age group	18–64	15,456	10.5 (9.9 – 11.2)
	65 and older	5,215	8.1 (7.3 – 9.0)
Educational level	< 12 years	2,266	13.2 (11.1 – 15.2)
	HS Diploma or higher	18,601	9.7 (9.2 – 10.3)
Household income	< \$25,000 per year	4,747	12.3 (11.0 – 13.5)
	> \$25,000 per year	13,047	9.4 (8.8 – 10.0)
Race/Ethnicity	Hispanic	1,670	7.6 (5.9 – 9.2)
	Black, non-Hispanic	656	11.1 (8.1 – 14.0)
	White, non-Hispanic	17,727	10.3 (9.7 – 10.8)
Overall		20,921	10.1 (9.5 – 10.6)

¹ Sample of respondents with a “yes” or “no” response to the question about current asthma.

² Weighted data.

Data Source: 2003–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

ASTHMA IN CHILDREN

Measuring Child Asthma Prevalence

Prevalence of asthma in children (<17 years old) comes from two Rhode Island Department of Health surveys: (1) Behavioral Risk Factor Surveillance System (BRFSS) and (2) Youth Risk Behavior Surveillance System (YRBS).

TABLE 7. LIFETIME AND CURRENT CHILDHOOD ASTHMA PREVALENCE QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007

Lifetime asthma prevalence	Have you ever been told by a doctor, nurse, or other health professional that [child] had asthma?
Current asthma prevalence	Does the [child] still have asthma?

Behavioral Risk Factor Surveillance System (BRFSS)

As described previously, BRFSS is one of the most important surveys for measuring asthma prevalence and related health outcomes in Rhode Island and nationally. Beginning in 2005, BRFSS added the Random Child Selection Module. The module was added as an additional step

before the administration of the Child Asthma Prevalence Module. Instead of asking about the asthma status of all children in the household, one particular child was chosen at random and questions were asked regarding that child. Due to the change in survey design, results for child asthma prevalence in 2005 BRFSS and later years cannot be compared with questions about child asthma prevalence asked in earlier years. In 2007,

the latest data available for this report, the child sample was 49% female and 28% of the children were under age 5.

Information on asthma in Rhode Island children comes from responses to two asthma questions on BRFSS Child Asthma Prevalence Module provides (see Table 7).

Trends in Child Asthma Prevalence

Between 2005 and 2007, both lifetime and current asthma rates in children remained stable over time with no significant differences from one year to the next (see Figure 8). The most recent report from the National Health Interview Survey (NHIS) published in 2007 shows that, in 2006, 14% of US children have ever been diagnosed with asthma and 9% still have asthma (data not shown).¹⁷

Child Asthma Prevalence Aggregated Over Time

As with adults, trends in asthma prevalence can be tracked by looking at individual years of data or by combining several years of data. Based on aggregated data for three years, an estimated 17% of Rhode Island children have been diagnosed with asthma at some point in their lifetime—about 39,000 children. Eleven percent of Rhode Island children currently have asthma—about 27,000 children (see Table 8 and Figure 8).

TABLE 8. ASTHMA PREVALENCE IN CHILDREN AGGREGATED OVER TIME, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007*

	TOTAL NUMBER OF RESPONDENTS	LIFETIME ASTHMA (95% CI)	CURRENT ASTHMA (95% CI)
Children 0–17 years	3,691	16.5 (15.1 – 17.9)	11.3 (10.1 – 12.5)
Weighted sample	236,257	39,102	26,696

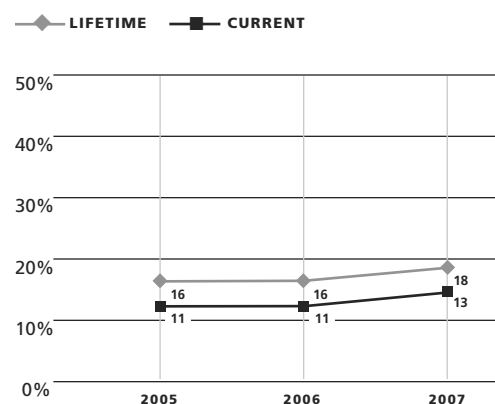
Data Source: 2005–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

* Percentages, 95% confidence intervals and corresponding sample sizes are weighted.

Disparities in Child Asthma Prevalence

Data from 2005–2007 BRFSS combined file underscore substantial differences in the prevalence of asthma in children by age and sex. Information on a child's race/ethnicity was asked only in 2005 and 2006 BRFSS, and the numbers of minority children in each year are too small for analysis. Therefore, asthma prevalence in children by race/ethnicity is not shown. Disparities by sex and age are highlighted in Table 9 and Figure 9.

FIGURE 8. TRENDS IN LIFETIME AND CURRENT PEDIATRIC ASTHMA PREVALENCE BY YEAR, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007



Data Source: 2005–2007 Rhode Island Behavioral Risk Factor Surveillance System, Rhode Island Department of Health, Center for Health Data and Analysis.

- **Age.** Current asthma rates are *significantly higher* among children in the 12-to-17 year age group than children 0 to 4 years of age (see Table 9).
- **Sex and age.** Current asthma prevalence is *significantly higher* among boys aged 12 to 17 than it is among boys and girls 0 to 11 years of age (see Figure 9). Among children aged 12 to 17 years, the prevalence of asthma was not significantly higher for boys than girls (Boys 12–17 years: 15.6%, 95% CI = 12.4 – 18.8; Girls 12–17 years: 12.0%, 95% CI = 9.3 – 14.7). National data show that boys are more likely than girls to have ever been diagnosed with asthma (16% and 11%, respectively) and to still have asthma (11% and 8%, respectively).¹⁷

TABLE 9. DISPARITIES IN CURRENT PEDIATRIC ASTHMA PREVALENCE, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007

CHARACTERISTICS OF CHILDREN (0–17 YRS)		ASTHMA SAMPLE	
		UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE PERCENTAGE (95% CI) ²
Sex	Male	1,864	12.6 (10.9 – 14.4)
	Female	1,712	10.2 (8.4 – 11.9)
Age group	0–4	829	8.1 (5.9 – 10.4)
	5–11	1,249	11.6 (9.5 – 13.7)
	12–17	1,370	13.6 (11.6 – 15.8)
Overall		3,625	11.3 (10.1 – 12.5)

¹ Sample of respondents with a “yes” or “no” response to the question about current asthma.

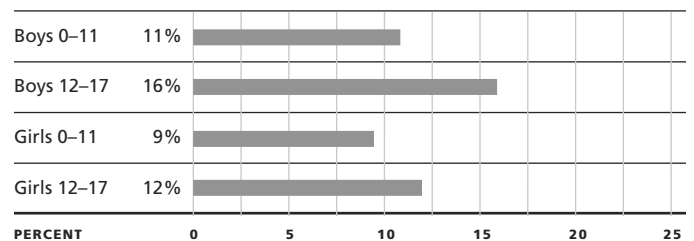
² Weighted data.

Data Source: 2005–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Missed School Days

Asthma accounts for more school absenteeism than any other chronic disease, with 14 million lost days of school annually. Excessive school absence disrupts learning and is a strong predictor of premature school dropout.¹⁸ In 2005–2007 BRFSS, 25% of children missed one or more school days due to asthma (95% CI = 18.6 – 31.2; data not shown).

FIGURE 9. PERCENTAGE OF CHILDREN WITH CURRENT ASTHMA BY SEX AND AGE GROUP, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007



Data Source: 2005–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

PUBLIC HEALTH MESSAGE: Children with asthma are absent from school more often compared to their healthy peers, and this appears to be driven by the underlying severity of asthma symptoms. The Rhode Island Asthma Control Program partners with Hasbro Children’s Hospital in Providence, Rhode Island, on the hospital’s nationally recognized, evidence-based Draw-A-Breath program. Draw-A-Breath is an innovative asthma education program for children and their parents designed to provide families with the knowledge, skills, and tools to effectively manage asthma.

ASTHMA IN MIDDLE AND HIGH SCHOOL STUDENTS

Measuring Asthma Prevalence in Middle and High School Students

Youth Risk Factor Surveillance Survey (YRBS)

This section presents findings from YRBS. YRBS is a survey that is administered every other year to public high school students in Rhode Island to assess health risk behaviors. The survey is administered by the Rhode Island Department of Health in collaboration with the Rhode Island Department of Education, with guidance from CDC.

In 2005, two asthma-related questions assessed lifetime asthma prevalence and current asthma prevalence using similar wording as BRFSS (see Table 10). In 2007, the state conducted its first middle-school YRBS among 2,382 students for a response rate of 81%. The weighted, self-reported data presented here are representative of public middle

and high school students statewide and can be used to make important inferences about asthma prevalence among pre-teens and teens enrolled in public schools.¹⁴ YRBS survey results are only representative of the public middle and high school population in Rhode Island—not of all Rhode Island youth.

TABLE 10. LIFETIME AND CURRENT CHILDHOOD ASTHMA PREVALENCE QUESTIONS, RHODE ISLAND YOUTH RISK BEHAVIORAL SURVEY (YRBS), 2007

Lifetime asthma prevalence	Has a doctor or nurse ever told you that you have asthma?
Current asthma prevalence	Do you still have asthma?

Asthma Prevalence in Middle and High School Students

Data from 2007 YRBS show that 14% of Rhode Island high school and 13% of Rhode Island middle school students currently have asthma (see Table 11). Self-reported estimates of current asthma for Rhode Island students are higher than prevalence estimates from national YRBS. Approximately 11% of high school students in national YRBS reported being diagnosed with asthma and still had asthma at the time of the 2007 survey (Current asthma prevalence: 10.9%, 95% CI 10.1 – 11.9).¹⁹

TABLE 11. PERCENTAGE OF PUBLIC SCHOOL STUDENTS WITH CURRENT ASTHMA, YOUTH RISK BEHAVIORAL SURVEY (YRBS), 2007

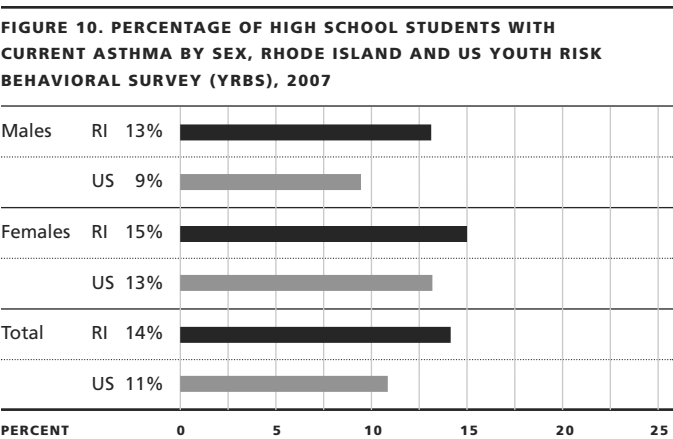
CHARACTERISTICS	ASTHMA SAMPLE	
	UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE PERCENTAGE (95% CI) ²
High School, Rhode Island	2,141	13.6 (12.1 – 15.1)
Middle School, Rhode Island	2,339	13.4 (11.7 – 15.3)

¹ Sample of respondents with a “yes” or “no” response to the question about current asthma.

² Weighted data.

Data Source: 2007 Rhode Island Youth Risk Behavior Survey, Rhode Island Department of Health, Center for Health Data and Analysis.

Current asthma is more common among high school boys in Rhode Island (13%) than among high school boys nationally (9%; see Figure 10). Asthma prevalence was slightly higher, but not significantly higher, among high school girls than high school boys in Rhode Island (15% vs. 13%). In young children under the age of 12, boys are more likely to have asthma than girls, but this difference disappears after puberty.



Data source: 2007 Rhode Island Youth Risk Behavior Survey, Rhode Island Department of Health, Center for Health Data and Analysis and 2007 YRBS: Youth Risk Behavior Surveillance System, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Adolescent and School Health Data and Statistics. Available at: <http://www.cdc.gov/HealthyYouth/yrebs/index.htm>



Asthma Prevalence in BRFSS vs. YRBS

Despite a difference in survey design between BRFSS and YRBS (reporting of asthma in children by proxy vs. self-report), the prevalence of current asthma among Rhode Island high school students in grades 9 to 12, as reported by 2007 YRBS, is consistent with 2007 BRFSS where 14% of children 12 to 17 years of age currently have asthma.

Disparities in Asthma Prevalence in Middle and High School Students

Findings from 2007 YRBS show that the percentage of Rhode Island middle and high school students with current asthma did not differ significantly by sex, by age group, or by race/ethnicity (see Table 12). Additional years of aggregated data will provide more precise estimates of asthma prevalence by markers of disparity.

TABLE 12. CURRENT ASTHMA PREVALENCE AMONG MIDDLE AND HIGH SCHOOL STUDENTS BY MEASURES OF DISPARITY, RHODE ISLAND YOUTH RISK BEHAVIORAL SURVEY (YRBS), 2007

		MIDDLE SCHOOL ASTHMA SAMPLE		HIGH SCHOOL ASTHMA SAMPLE	
CHARACTERISTICS		UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE % (95% CI) ²	UNWEIGHTED SAMPLE ¹	CURRENT ASTHMA PREVALENCE % (95% CI) ²
Sex	Male	1,161	14.4 (12.3 – 16.9)	1,041	12.6 (10.6 – 14.9)
	Female	1,175	12.3 (10.2 – 14.8)	1,094	14.5 (12.0 – 17.4)
Age group	11 or younger	251	10.0 (6.5 – 14.0)	–	–
	12	606	11.4 (8.4 – 15.4)	–	–
	13	847	15.4 (12.9 – 18.3)	–	–
	14 or older	632	14.7 (11.4 – 18.8)	–	–
	15 or younger	–	–	822	13.7 (11.3 – 16.5)
	16 or 17	–	–	1,074	14.1 (12.4 – 16.1)
	18 or older	–	–	243	11.1 (7.8 – 15.5)
Race/ethnicity ³	Hispanic	622	15.1 (12.9 – 19.8)	421	12.4 (9.1 – 16.5)
	Black	142	12.3 (7.4 – 19.8)	128	10.9 (6.0 – 19.1)
	White	1,242	12.6 (10.8 – 14.8)	1,323	14.1 (12.1 – 16.4)
Overall		2,339	13.4 (11.7 – 15.3)	2,141	13.6 (12.1 – 15.2)

¹ Sample of respondents with a “yes” or “no” response to the question about current asthma.

² Weighted data.

³ Black and white students are non-Hispanic.

Data not applicable are noted with a dash.

Data source: 2007 Rhode Island Youth Risk Behavior Survey, Rhode Island Department of Health, Center for Health Data and Analysis.



WHAT ARE MODIFIABLE RISK FACTORS FOR ASTHMA?

Modifiable risk factors for asthma are things that a person can control, change, or modify by shifting his/her lifestyle or taking medications to reduce the risk of having more severe asthma.

This section examines three modifiable risk factors shown to increase the chance that a person will have asthma symptoms or have more severe asthma once the disease develops. These risk factors include obesity, cigarette smoking, and exposure to secondhand smoke.

Risk factors that increase the likelihood of having more severe asthma include obesity, cigarette smoking, and exposure to secondhand smoke.

Obesity. Evidence is now mounting that obesity is a risk factor for asthma. Yet, little is known about how exactly obesity influences asthma. Some experts suggest that excess weight pressing on the lungs may trigger the hyperreactive response in the airways typical of asthma. Others believe that asthma leads to obesity by inhibiting physical activity, although several studies have found no difference in activity levels between people with or without asthma. Some studies suggest that many obese people may be misdiagnosed as having asthma when in fact they are simply short of breath, possibly because of the increased effort required for breathing.²⁰

Cigarette smoking. Tobacco use is associated with many chronic diseases, and tobacco smoke is a powerful asthma trigger. Asthma and active cigarette smoking interact to cause more severe asthma symptoms, accelerate decline in lung function, and reduce short-term therapeutic response to corticosteroids.²¹

Exposure to secondhand smoke. Secondhand smoke poses a serious and pervasive health risk to children and adults. According to the 2006 US Surgeon General's report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke*, living with someone who smokes or having frequent, prolonged exposure to secondhand smoke, such as in a home or work setting, increases the risk for developing asthma.²² Of particular concern is secondhand smoke exposure in children, as there is evidence that secondhand smoke is a potent factor in the development of asthma in children.

Asthma Risk Factors in Adults

BRFSS assesses asthma risk factors in adults (ages 18+). Table 13 shows the wording of risk factor questions related to asthma in BRFSS.

TABLE 13. ASTHMA RISK FACTOR QUESTIONS, BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)	
RISK FACTOR ¹	BRFSS QUESTIONS
Weight status	Weight status is computed from a person's self-reported height and weight. Data on self-reported height and weight is used to calculate body mass index (BMI). Being obese is defined as a BMI of greater than or equal to 30.
Cigarette use	Smoking status is computed from a person's response to two questions: (1) Have you smoked at least 100 cigarettes in your entire life? (2) Do you now smoke cigarettes every day, some days, or not at all?
Secondhand smoke	Does anyone smoke regularly inside the home?

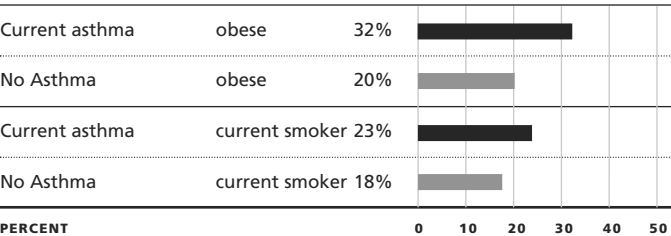
¹ The question on secondhand smoke was asked in the 2000 and 2001 RI BRFSS. Weight status and smoking status are assessed every year on BRFSS.

Because BRFSS is a cross-sectional survey, it only provides information at one point in time. Thus, we cannot say whether people began smoking or became obese before they developed asthma or if people started smoking or became obese after they developed asthma.

Although we cannot determine the direction of causation between two variables in cross-sectional data, this section looks at the relationship between current asthma and health status in two ways. First, we compare adults with and without current asthma with respect to weight status and smoking status. Figure 11 shows significant differences in weight status and smoking status between Rhode Island adults with asthma and those without asthma at the time of BRFSS survey.

We cannot say whether people began smoking or became obese before they developed asthma or if people started smoking or became obese after they developed asthma.

FIGURE 11. WEIGHT STATUS AND SMOKING STATUS AMONG ADULTS WITH AND WITHOUT CURRENT ASTHMA, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2007



Data Source: 2005–2007 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

In 2005–2007 BRFSS:

- **Obesity.** Adults with current asthma were *significantly more likely* to be obese (32.3%, 95% CI = 28.9 – 35.8) than adults without asthma (20.0%, 95% CI = 19.1 – 21.0). Being obese was defined as a body mass index (BMI) of greater than or equal to 30.
- **Current smoker.** Adults with current asthma were *significantly more likely* to be current smokers (23.4%, 95% CI = 20.2 – 26.7) than adults without asthma (18.1%, 95% CI = 17.1 – 19.1).

A second way to look at BRFSS data for 2005–2007 is to ask:

1. Are adults who are obese more likely to have asthma than adults who are not obese?
As noted above, being obese was defined as a body mass index (BMI) of greater than or equal to 30.
2. Are adults who smoke more likely to have asthma than adults who do not smoke?

Obesity

Adults who were obese were *significantly more likely* to have asthma (16.0%, 95% CI = 13.8 – 17.4) than adults who were not obese (9.0%, 95% CI = 8.0 – 9.6). The question, though, is whether obesity leads to asthma (or asthma-like symptoms), or whether asthma leads to excess weight gain? People who have asthma are often less active because of their breathing problems. Nonetheless, airway inflammation (e.g., swelling of the airways and tightening of airway muscles) is a common trait that occurs both in obesity and asthma. The common inflammatory process has led experts to conclude that obesity is a significant but modest risk factor for asthma that is modified by factors such as age and sex.²³

Current smokers

Adults who smoked were *significantly more likely* to have asthma (13.0%, 95% CI = 11.0 – 15.0) than adults who were not current smokers (10.0%, 95% CI = 9.0 – 10.5). Studies on the effect of smoking on adulthood asthma have provided contradictory results. More research is needed to study lifetime smoking, rather than focusing only on current smoking, in order to have a more accurate understanding of the relationship between smoking and adult-onset asthma.

Secondhand smoke

Adults with current asthma were as likely to live with a current smoker in the home as adults without asthma (2000–2001 BRFSS: 20% vs. 22%; data not shown).

Regardless, having 1 in 5 adults with asthma exposed to second-hand smoke is still too high. An important part of asthma education is helping people with asthma understand that secondhand smoke can trigger asthma episodes and increase the severity of attacks.

The finding that 1 in 5 adults with asthma were exposed to second-hand smoke is of concern. An important part of asthma education is helping people with asthma understand that secondhand smoke can trigger asthma episodes and increase the severity of attacks.

Asthma Risk Factors in Middle School and High School Students

In 2007 YRBS, survey questions assessed weight status and tobacco use among middle school and high school students (grades 6–12; see Table 14). Only middle school students were asked about exposure to secondhand smoke in the home.

TABLE 14. ASTHMA RISK FACTOR QUESTIONS, YOUTH RISK BEHAVIORAL SURVEY (YRBS)

RISK FACTOR	YRBS QUESTIONS
Weight status	Weight status is computed from an adolescent's self-reported height and weight. Data on self-reported height and weight is used to calculate body mass index (BMI) and to determine the corresponding BMI-for-age percentile for adolescents.
Cigarette use	Smoking status is computed from an adolescent's response to two questions: (1) Have you ever tried cigarette smoking, even one or two puffs? [Lifetime cigarette use] (2) Have you smoked cigarettes on at least 1 day during the 30 days before the survey? [Current cigarette use]
Secondhand smoke	Does anyone who lives with you now smoke cigarettes?

Obesity

It is well known that overweight children face increased health risks, including problems with asthma. It has long been thought that around age 12, or the start of puberty, many children outgrow asthma. But children who are overweight or obese at the time of puberty often continue to have asthma problems into their teenage years. In 2007 YRBS, high school students who were obese (i.e., > 95th percentile for body mass index by age and sex) were as likely to have current asthma (15.6%, 95% CI = 9.5 – 21.5) as adolescents who were not obese (13.4%, 95% CI = 11.9 – 14.9). However, the number of high school students who were obese and had current asthma was small (n = 34) and the 95% confidence intervals were wide and imprecise.

Cigarette Use

Smoking among adolescents who have asthma may be a serious health problem. Research suggests that regular smoking among pre-adolescents and adolescents increases the risk for asthma among teenagers, especially for non-allergic adolescents.²⁵ Educating teens about the health risks of cigarette smoking is very important. Children and teens who smoke cigarettes have nearly four times the risk of developing asthma in their teenage years compared to children and teens who do not smoke.²⁵ In 2007 YRBS, high school students who were current smokers were as likely to have current asthma (12.1%, 95% CI = 8.6 – 15.7) as adolescents who did not smoke (13.5%, 95% CI = 11.9 – 15.1). Of note, confidence intervals are influenced by sample size and the small number of high school students who currently smoked and had current asthma (n = 36) resulted in 95% confidence intervals that were wide and imprecise.

Secondhand smoke

In 2007 YRBS, nearly 40% of middle school students (37.8%) lived with someone who was a current smoker, putting 12,177 children at risk for serious health problems. The 2006 report from the US Surgeon General on smoking highlighted how vulnerable children are to secondhand smoke.²² Children exposed to secondhand smoke are at an increased risk for sudden infant death syndrome (SIDS), acute respiratory infections, ear problems, worsening of allergies, and more severe asthma in those who have the disease.

Educational Programs on Tobacco Use

Educational programs for school-aged youth on the dangers of tobacco use are an effective strategy for reducing smoking prevalence among children and teens. Data from 2007 YRBS show that 68% of public middle school students, both boys and girls, reported that they had been taught about the dangers of tobacco use in one of their classes (data not shown).

PUBLIC HEALTH MESSAGE: It's a known fact—smoking, first or secondhand, is bad for a person's health. The Rhode Island Asthma Control Program partners with the state's Tobacco Control Program to create and sustain smoke-free environments. Rhode Island is the seventh state to go smoke free in worksites and public places. New initiatives focus on reducing exposure to secondhand smoke in public housing units.





WHAT IS THE QUALITY OF LIFE AND HEALTH CARE USE FOR ADULTS WITH ASTHMA?

QUALITY OF LIFE

Having asthma can affect every facet of a person's daily life. The good news is that, if properly managed, asthma does not have to prevent a person from leading a healthy, active life. Asthma treatment goals are mainly centered on asthma control. The goals of asthma treatment are to help persons with asthma control and manage day and nighttime symptoms, to minimize activity limitations such as experiencing difficulty breathing when doing simple chores or walking, and to reduce the risk of an asthma attack. In addition, effectively managing an individual's asthma may decrease health care use for persons with asthma. Health care use for asthma includes outpatient visits to doctors' offices, clinics, visits to hospital EDs, and inpatient hospitalizations.

BRFSS Adult Asthma History Module (see Table 15) provides information about asthma-related symptoms, quality of life, and health care use for persons with asthma. Analysis of questions in the Adult Asthma History Module combined data from the most recent years that a question was asked to increase sample size and obtain more reliable estimates. Markers of disparity are sex, age group, educational level, household income, and race/ethnicity.

This section examines quality of life for people with asthma, as well as various aspects of health care utilization for individuals with asthma, including routine office visits for asthma, urgent care for worsening asthma symptoms, use of asthma management plans, and data on flu shots.

This section examines quality of life for people with asthma, as well as various aspects of health care utilization for individuals with asthma, including: routine office visits for asthma, urgent care for worsening asthma symptoms, use of asthma management plans, and data on flu shots.

TABLE 15. ADULT ASTHMA HISTORY MODULE, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

DOMAIN*	MEASURE
Quality of Life	Asthma symptoms in the past 30 days
	Asthma attack in the past year
	Took prescription asthma medication to prevent an asthma attack from occurring in the past 30 days
	Used prescription asthma inhaler during asthma attack to stop attack in the past 30 days
	Interrupted sleep due to asthma symptoms in the past month
	Unable to work or carry out usual activities in the past year because of asthma
	Missed work in the past year due to asthma
Health Care	Asthma management plan from doctor or health care provider
	Number MD visits in the past year for routine asthma checkups
	Number MD visits in the past year because asthma getting worse
	Number urgent care or emergency room visits in the past year for asthma
	Flu vaccine in the past year

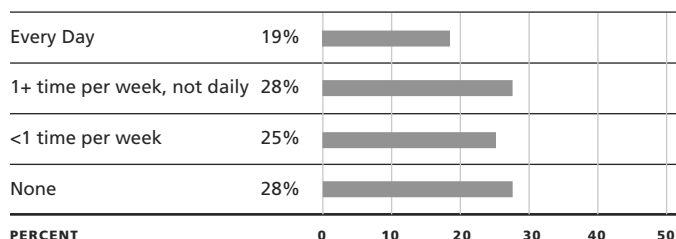
* Between 2001 and 2007, some questions were asked in each of three years and some questions were asked in two years. Questions on limited activity due to asthma were asked in each of four years. The question on having a recent flu shot was asked every year.

Asthma Symptoms

In BRFSS, persons with asthma were asked: *During the past 30 days, how often did you have any symptoms of asthma? Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness and phlegm production when you don't have a cold or respiratory infection.*

Most adults with asthma reported that they had asthma-related symptoms less than once a week (25%) or not at all (28%). But 19% of adults with current asthma reported experiencing daily symptoms of asthma in the last 30 days and 28% reported having asthma symptoms at least once a week or more often (see Figure 12). Daily controller medications help prevent asthma symptoms and attacks.

Most adults with asthma reported that they had asthma-related symptoms less than once a week or not at all. But 19% of adults with current asthma reported experiencing daily symptoms of asthma in the last 30 days and 28% reported having asthma symptoms at least once a week or more often.

FIGURE 12. PERCENTAGE OF ADULTS REPORTING ASTHMA SYMPTOMS IN THE PAST 30 DAYS, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2002, 2005–2006

Data Source: 2002, 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Disparities in Asthma Symptoms

Household income. Among Rhode Island adults with current asthma, a *significantly higher percentage* of low-income adults than higher-income adults reported asthma symptoms most days of the week or daily (61% vs. 42%; see Table 16).

The wide overlapping confidence intervals for asthma symptoms by other markers of disparity mean that the groups being compared are not significantly different from one another. Future administrations of the question about asthma symptoms will allow for more years of data to be combined and provide more precise estimates of potential disparities in asthma symptoms. People with asthma experience symptoms when the airways tighten, inflame, or fill with mucus, but not every person with asthma has the same symptoms in the same way.

TABLE 16. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA THAT EXPERIENCED ASTHMA SYMPTOMS IN THE PAST MONTH BY MEASURES OF DISPARITY, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2002, 2005–2006

CHARACTERISTICS		ASTHMA SAMPLE	
		UNWEIGHTED SAMPLE ¹	ASTHMA SYMPTOMS ² PERCENTAGE (95% CI) ³
Sex	Male	291	49.3 (41.9 – 56.7)
	Female	900	46.2 (42.1 – 50.2)
Age group	18–64	944	46.2 (42.0 – 50.4)
	65 and older	237	54.0 (46.8 – 61.3)
Educational level	< 12 years	164	58.4 (47.5 – 69.3)
	HS Diploma or higher	1,026	45.4 (41.6 – 49.2)
Household income	< \$25,000 per year	328	60.7 (53.5 – 67.9)
	> \$25,000 per year	687	42.0 (37.6 – 46.4)
Race/ethnicity ⁴	Minority	174	42.3 (33.2 – 51.4)
	White, non-Hispanic	1,002	48.5 (44.4 – 52.5)
Overall		1,191	47.2 (43.5 – 50.9)

¹ Sample of respondents with a “yes” or “no” response to the question about asthma symptoms.

² Asthma symptoms reported at least once or twice a week to daily.

³ Weighted data.

⁴ Race/ethnicity: Minorities include persons of Hispanic origin of any race as well as non-Hispanic blacks and non-Hispanics in the “other” race category, which includes Asian Americans, American Indians, and persons of “Two or More Races.” These groups are combined due to their small populations, which prevent meaningful statistical analyses of the groups individually.

Data Source: 2002, 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Asthma Attacks

In 2005 and 2006 BRFSS, persons with asthma were asked three questions about asthma episodes:

1. *During the past 12 months, have you had an episode of asthma or an asthma attack?*
2. *During the past 30 days, how many days did you take a prescription asthma medication to prevent an asthma attack from occurring?*
3. *During the past 30 days, how often did you use a prescription asthma inhaler during an asthma attack to stop it?*

An estimated 46% of Rhode Island adults with asthma reported having an asthma attack in the past year (95% CI = 41.5 – 50.4; see Figure 13). Asthma attacks can be an important indicator of asthma control and may result in an ED visit or a hospitalization for asthma that is out of control. Reducing exposure to asthma triggers and taking medications as prescribed are important self-management steps to help control asthma and prevent an asthma attack.

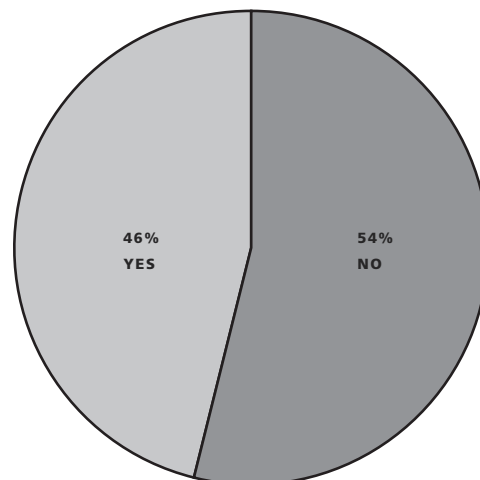
Shown in Figure 14 are responses to the question, *During the past 30 days, how many days did you take a prescription asthma medication to prevent an asthma attack from occurring?* Asthma medications used to prevent asthma attacks are called controller medications. Controller medications, also called preventive or maintenance medications,

work over a period of time to reduce airway inflammation and help prevent asthma symptoms from occurring. They may be inhaled or swallowed as a pill or liquid. Because controller medications should be taken daily, Figure 14 compares persons who answered no days, or one to 24 days with persons who answered 25 to 30 days.

Forty-two percent of Rhode Island adults with current asthma reported using a prescription asthma inhaler nearly every day in the past 30 days to prevent an asthma attack from occurring (95% CI = 38.0 – 46.7; see Figure 14).

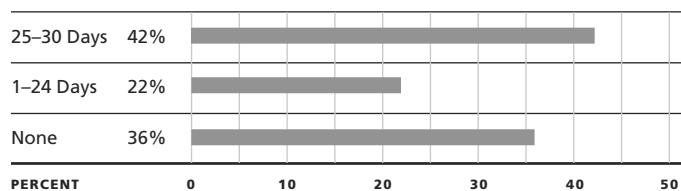
Shown in Figure 15 are responses to the question, *During the past 30 days, how often (number of times) did you use a prescription asthma inhaler during an asthma attack to stop it?* Asthma medications to stop attacks once they occur are called rescue medications. Rescue medications, also called quick-relief or fast-acting medications, work immediately to relieve asthma symptoms when they occur. These types of medicines are often inhaled directly into the lungs, where they open up the airways and relieve symptoms, such as wheezing, coughing, and shortness of breath, often within minutes. Rescue medications, however, provide temporary relief of symptoms, not long-term benefits.

FIGURE 13. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA THAT HAD AN ASTHMA ATTACK IN THE PAST YEAR, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2006



Data Source: 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

FIGURE 14. PERCENTAGE OF ADULTS USING CONTROLLER MEDICATIONS ON ONE OR MORE DAYS TO PREVENT AN ASTHMA ATTACK FROM OCCURRING, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2006



Data Source: 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

As previously mentioned, asthma attacks are one important indicator of asthma control. Combined data from 2005 and 2006 BRFSS indicate that one-fourth of Rhode Island adults with current asthma reported using rescue medication five or more times in the past 30 days to stop an asthma attack (95% CI = 19.3 – 27.8; see Figure 15).

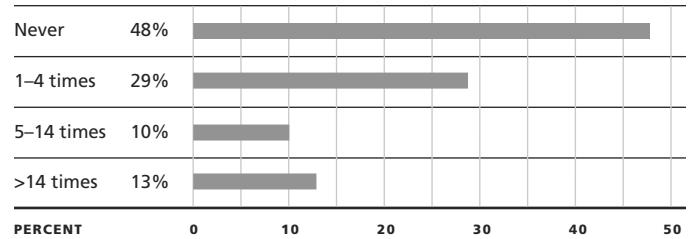
Disparities in Asthma Attacks

Table 17 displays the percentage of adults with a recent asthma episode by markers of disparity. The number of people with asthma from minority populations responding to 2005–2006 BRFSS was too low for meaningful statistical analysis (n = 126).

- **Age.** The likelihood of having an asthma attack was *significantly higher* in adults aged 18 to 64 than adults ages 65 and older (49% vs. 28%). Adults aged 65 and older were *significantly more likely* than adults in the 18-to-64 year old age group to use controller medication almost daily to prevent an asthma attack from occurring (64% vs. 38%).
- **Income.** Adults with household incomes below \$25,000 *were significantly more likely* to use rescue medications five or more times in the past 30 days during an asthma attack to stop the attack than adults with higher household incomes (37% vs. 18%).

PUBLIC HEALTH MESSAGE: The higher use of rescue medications by adults, with low incomes is a concern. Rescue medications are an important part of asthma treatment but they can be overused. Asthma education is recommended regarding the importance of controller and rescue medications for people with asthma.

FIGURE 15. PERCENTAGE OF ADULTS USING RESCUE MEDICATIONS IN PAST 30 DAYS TO STOP AN ASTHMA ATTACK FROM OCCURRING, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2006



Data Source: 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

TABLE 17. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA THAT EXPERIENCED ASTHMA EPISODES BY MEASURES OF DISPARITY, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2006

CHARACTERISTICS		ASTHMA SAMPLE ¹		
		ASTHMA ATTACK IN THE PAST YEAR	USED CONTROLLER MEDICATION ALMOST DAILY IN PAST 30 DAYS TO PREVENT AN ATTACK	USED RESCUE MEDICATION 5+ TIMES IN PAST 30 DAYS TO STOP ATTACK
		% (95% CI)	% (95% CI)	% (95% CI)
Sex	Male	41.9 (32.9 – 51.1)	45.1 (36.2 – 54.1)	28.0 (18.4 – 37.5)
	Female	48.0 (43.1 – 53.9)	40.8 (36.2 – 45.5)	21.2 (17.5 – 25.0)
Age group	18–64	49.2 (44.1 – 52.9)	38.3 (33.5 – 43.2)	24.2 (19.3 – 29.0)
	65 and older	28.4 (21.7 – 35.2)	64.4 (56.8 – 72.0)	20.3 (13.8 – 26.8)
Educational level	< 12 years	48.8 (34.3 – 63.4)	41.9 (37.5 – 46.4)	–
	HS Diploma or higher	45.4 (40.9 – 49.9)	44.8 (30.2 – 59.2)	–
Household income	< \$25,000 per year	47.4 (37.5 – 57.4)	41.0 (35.8 – 46.2)	17.8 (13.6 – 22.0)
	> \$25,000 per year	43.6 (38.5 – 48.9)	40.2 (31.0 – 49.4)	36.6 (26.2 – 47.0)
Overall		45.9 (41.9 – 50.4)	42.3 (38.0 – 46.7)	23.6 (19.3 – 27.8)

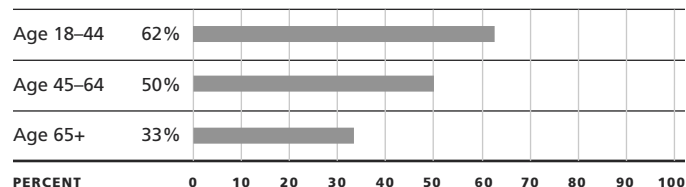
– Sample sizes too small for analysis.

¹ Weighted data.

Data Source: 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Figure 16 shows whether the relationship between frequent use of controller medication to prevent an asthma attack and having an asthma attack varies by age group. Because older people tend to have worse asthma symptoms and a higher risk of death from asthma than younger people, it is important for elderly patients to keep their asthma under control. Data from combined 2005 and 2006 BRFSS show that adults aged 65 and older who used a controller medication 15 or more days of the month to prevent an asthma attack are less likely to have an asthma attack in the past year than younger-aged adults who used a controller medication on most days of the month and had an asthma attack in the past year. It is possible that some younger aged adults are not using their asthma medications correctly but this cannot be answered through BRFSS data.

FIGURE 16. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA THAT USED CONTROLLER MEDICATION 15 OR MORE DAYS IN THE PAST MONTH TO PREVENT AN ASTHMA ATTACK AND HAD AN ASTHMA ATTACK IN PAST YEAR BY AGE GROUP, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2005–2006



Data Source: 2005–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Effects of Asthma on Sleep, Work, and Daily Activities

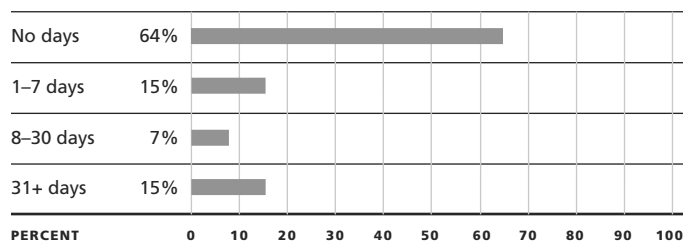
Symptoms of sleep apnea and other breathing problems during sleep are common among people with asthma. In 2004–2006 BRFSS, adults with asthma were asked: *During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?* Forty percent of Rhode Island adults with current asthma reported that asthma interrupted their sleep at night on one or more days in the past month (95% CI = 36.2 – 44.6; data not shown).

The 2004–2006 BRFSS assessed the impact of asthma on a person's daily activities: *During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?* Sixty-four percent of Rhode Island adults with asthma reported experiencing no missed days, 15% reported one to seven days of limited activity, and 22% reported eight or more days of limited activity in the past year due to asthma (see Figure 17).

Rhode Island adults with asthma also were asked how many days in the past 12 months they missed work because of their asthma. In 2005–2006 BRFSS, only a minority of adults with asthma reported missing one or more days of work due to their asthma (15%; data not shown). Missed workdays add to the economic costs of asthma by contributing to lost productivity and wages. According to CDC, adult asthma accounts for over 10 million missed workdays

annually. Additionally, many adults miss work to care for children with asthma—approximately 12.8 million school days are missed annually due to asthma.⁶

FIGURE 17. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA UNABLE TO WORK OR CARRY OUT THEIR USUAL ACTIVITIES IN THE PAST MONTH BECAUSE OF THEIR ASTHMA, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2004–2006



Data Source: 2004–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Disparities in Asthma-related Quality of Life

This section examines disparities in asthma-related quality of life by sex, age group, and household income (see Table 18). The number of respondents with asthma-related quality of life concerns who had less than a high school education or who were a minority group member was too small for meaningful comparisons.

In 2004–2006 BRFSS:

- **Age.** The likelihood of having asthma interrupt one's sleep at night was *significantly higher* in adults aged 18 to 64 than adults ages 65 and older (42% vs. 31%). Although the 95% confidence intervals slightly overlapped for the two age groups, the chi-square statistic indicated that the two age groups were significantly different on this quality of life measure ($P < 0.01$).
- **Income.** Adults with a household income below \$25,000 per year were *significantly more likely* to report that asthma interrupted their sleep at night (55.3% vs. 32.7%) and that asthma restricted levels of functioning (47.9% vs. 31.3%) than adults who had higher incomes.

TABLE 18. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA THAT EXPERIENCED SLEEP DISTURBANCES OR LIMITED ACTIVITY DAYS DUE TO ASTHMA BY MEASURES OF DISPARITY, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2004–2006

CHARACTERISTICS		ASTHMA SAMPLE		ASTHMA SAMPLE	
		UNWEIGHTED SAMPLE ¹	INTERRUPTED SLEEP	UNWEIGHTED SAMPLE ¹	LIMITED IN USUAL ACTIVITIES
			1+ DAYS PAST MONTH % (95% CI) ²		1+ DAYS PAST YEAR % (95% CI) ²
Sex	Male	229	39.4 (30.8 – 48.0)	293	36.8 (29.1 – 44.4)
	Female	747	40.9 (36.2 – 45.5)	936	36.2 (32.3 – 40.2)
Age group	18–64	764	42.0 (37.2 – 46.8)	957	37.0 (32.8 – 41.2)
	65 and older	203	31.1 (23.9 – 38.5)	260	33.7 (27.1 – 40.3)
Household income	< \$25,000 per year	281	55.3 (46.9 – 63.7)	326	47.9 (40.0 – 55.8)
	> \$25,000 per year	561	32.7 (28.0 – 37.4)	734	31.3 (27.1 – 35.4)
Overall		976	40.4 (36.2 – 44.6)	1,229	36.4 (32.7 – 40.1)

¹ Sample of respondents with a “yes” or “no” response to questions about interrupted sleep and limitations in activities due to asthma.

² Weighted data.

Data Source: 2004–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

HEALTH CARE USE

Controlling Asthma Symptoms

As noted in the Introduction to this report, in 2007, the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health, and the National Asthma Education and Prevention Program (NAEPP) issued updated clinical guidelines for the diagnosis, treatment, and management of asthma by physicians.¹¹ The guidelines have four essential components of asthma management and associated activities (see Table 19).

In light of the new NAEPP guidelines, which place less emphasis on the classification of asthma by level of severity and more emphasis on a physician-patient partnership to control asthma symptoms, it is important to understand the health care use of Rhode Island adults with asthma. This section examines the various aspects of health care utilization for individuals with asthma, and includes data on doctor visits for asthma, having an asthma management plan from one's doctor, and flu shots. Data on hospitalizations and ED visits for asthma are presented in a separate section.

TABLE 19. NATIONAL HEART, LUNG, AND BLOOD INSTITUTE CLINICAL GUIDELINES FOR ASTHMA

Evaluation, monitoring	Use multiple measures of impairment to assess current/future risk
	Risk assessment includes both disease and treatment risks
	During initial presentation, asthma severity should guide clinical decision-making
	After treatment initiation, the level of asthma control should guide therapy
Patient education	Involve all the clinical team members in educating patients and establishing treatment goals, with key messages reinforced
	Teach patients to self-monitor and manage asthma; provide a written asthma plan
	Community pharmacies are a potential source of point-of-care asthma self-management education
	Computer and internet-based asthma education may be useful
	Targeted asthma education in the emergency department and hospital is associated with improved outcomes
Environmental factors, comorbidities	Patients with asthma should avoid allergens, cigarette smoke, fireplaces, and strong odors; reduce exertion outdoors when air pollution is high; avoid sulfite-containing foods; consider allergen immunotherapy
	Treating comorbidities of gastroesophageal reflux, sleep apnea, rhinitis/sinusitis, obesity, and chronic stress/depression is likely to improve asthma
	Single steps to control environmental allergens are usually insufficient
	Influenza vaccine does not reduce the frequency/severity of asthma exacerbations during flu season
Pharmacotherapy	The most effective asthma medications are those with anti-inflammatory effects
	Medications for long-term asthma control include corticosteroids, cromolyn sodium and nedocromil (Tilade), immunomodulators leukotriene modifiers, and the long-acting bronchodilators (LABAs) salmeterol (Serevent Diskus) and formoterol (Foradil Aerolizer)
	LABAs should not be used for acute exacerbations or as monotherapy for long-term control
	Short-acting bronchodilators (SABAs) are recommended for acute symptoms and exercise-induced asthma; anticholinergics are a useful alternative
	Systemic corticosteroids are used as an adjunct to SABAs to prevent recurrence and speed recovery

Source: National Heart, Lung, and Blood Institute. Guidelines for the Diagnosis and Management of Asthma (EPR-3). Available at www.nhlbi.nih.gov/guidelines/asthma

Health Care Use for Persons with Asthma

Having regular, planned physician appointments to manage one's asthma is an integral part of asthma care. A doctor's visit provides an opportunity for patients with asthma to assess their condition. Equally important, a doctor's visit for any medical reason provides an opportunity for a person with asthma to receive education on asthma self-management. Since asthma is a chronic disease, it requires continuous management and appropriate treatment, but this does not mean that a person with asthma cannot achieve optimal quality of life.

In 2004–2006 BRFSS, adults with current asthma were asked three questions about their use of the health care system for their asthma.

1. *During the past 12 months, how many times did you see a doctor, nurse, or other health professional for a routine checkup for your asthma?*
2. *During the past 12 months, how many times did you see a doctor, nurse or other health professional for urgent treatment of worsening asthma symptoms?*
3. *During the past 12 months, how many emergency room visits did you have because of asthma?*

- **Routine Office Visits for Asthma.** Nearly 60% of Rhode Island adults with current asthma reported that they had one or more routine medical visits in the past year for their asthma (59.3%, 95% CI = 55.7 – 63.0; data not shown).
- **Urgent Care Visit for Worsening Symptoms.** Among Rhode Island adults with current asthma, 27% reported that they had one or more urgent care visits in the past year because their asthma was getting worse (95% CI = 23.8 – 30.0; data not shown).
- **ED Visits for Asthma.** Among Rhode Island adults with current asthma, 17% reported that they had one or more asthma-related ED visits in the past year (95% CI = 14.3 – 20.0; data not shown).

Disparities in Health Care Use

Among adults aged 18 and older with current asthma, there were important differences in health care use by sex, age group, and household income (see Table 20). Findings are not shown for educational level because the sample size of persons with less than a high school education in combined 2004–2006 BRFSS was too small for meaningful comparisons.

In 2004–2006 BRFSS:

- **Sex.** Women were *significantly more likely* than men to have an urgent health care visit for asthma in the past year (30.3% vs. 19.8%).
- **Age.** Adults aged 65+ were *significantly more likely* than younger aged adults to have a routine office visit for asthma in the past year (73.1% vs. 56.9%).
- **Income.** Low-income adults were *significantly more likely* than higher-income adults to have an urgent health care visit for asthma in the past year (34.5% vs. 23.7%).

TABLE 20. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA THAT HAD A ROUTINE VISIT OR URGENT CARE VISIT FOR ASTHMA IN THE PAST YEAR BY MEASURES OF DISPARITY, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2004–2006

CHARACTERISTICS		ASTHMA SAMPLE		ASTHMA SAMPLE	
		UNWEIGHTED SAMPLE ¹	ROUTINE OFFICE VISIT FOR ASTHMA % (95% CI) ²	UNWEIGHTED SAMPLE ¹	URGENT CARE VISIT FOR ASTHMA % (95% CI) ²
Sex	Male	295	53.1 (45.7 – 60.5)	299	19.8 (14.2 – 25.5)
	Female	942	62.4 (58.3 – 66.4)	957	30.3 (26.6 – 34.0)
Age group	18–64	969	56.9 (52.7 – 61.1)	1,936	27.0 (23.5 – 30.6)
	65 and older	257	73.1 (66.8 – 79.4)	267	26.0 (20.2 – 31.9)
Household income	< \$25,000 per year	330	62.3 (54.5 – 70.3)	344	34.5 (27.8 – 41.2)
	> \$25,000 per year	731	58.0 (53.7 – 62.4)	739	23.7 (19.8 – 27.5)
Race/ethnicity ³	Minority	173	60.6 (51.3 – 69.9)	175	32.2 (23.5 – 41.0)
	White, non-Hispanic	1,051	58.8 (54.8 – 62.8)	1,068	25.9 (22.5 – 29.2)
Overall		1,237	59.3 (55.7 – 63.0)	1,256	26.9 (23.7 – 30.0)

¹ Sample of respondents with a “yes” or “no” response to the question about routine office visits for asthma or an urgent care visit for asthma.

² Weighted data.

³ Race/ethnicity: Minorities include persons of Hispanic origin of any race as well as non-Hispanic blacks and non-Hispanics in the “other” race category, which includes Asian Americans, American Indians, and persons of “Two or More Races.”

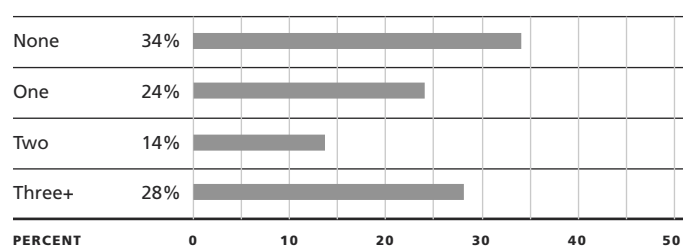
Data Source: 2004–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Another way to understand health care use among persons with asthma is to count the number of times a person had a routine check-up for asthma, and/or an urgent care visit for asthma, and/or an ED visit for asthma in the past year. Of the 1,340 adults with current asthma in 2004–2006 BRFSS, 92% answered questions about health care use related to their asthma (N = 1,227; unweighted data).

The findings shown in Figure 18 indicate that most Rhode Island adults with asthma reported that they had none or one medical visit for their asthma (58%), with a range of zero to 89 visits (data not shown). Among respondents reporting three or more health care visits

for their asthma, 80% reported between three and eight visits (data not shown). Health care use was based on respondent’s recall over a period of one year, which could potentially introduce inaccuracy,²⁶ especially over such a long period.

FIGURE 18. PERCENTAGE OF ADULTS WITH HEALTH CARE VISITS BECAUSE OF THEIR ASTHMA, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2004–2006¹



¹ Health care use is defined as the number of times an adult with asthma had a routine check-up for asthma, and/or an urgent care visit for asthma, and/or an emergency department visit for asthma in the past year.

Data Source: 2004–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Among adults with asthma, two population groups had high health care use because of their asthma: adults aged 65 and older and adults with household incomes below \$25,000 per year.

- **Age.** Adults aged 65+ were *significantly more likely* than younger aged adults to report that they had three or more health care visits in the past year because of their asthma. (Age 65+: 39.5%, 95% CI = 32.5 – 46.5; Age 18–64: 26.8%, 95% CI = 23.3 – 30.4).
- **Income.** Low-income adults were *significantly more likely* than higher-income adults to report that they had three or more health care visits in the past year because of their asthma. (Income < \$25,000: 41.7%, 95% CI = 34.6 – 48.8; Income > \$25,000: 23.1%, 95% CI = 19.4 – 26.8).

Asthma Management Plan

Early treatment of asthma exacerbations is the best strategy for management. Important elements of early treatment include a written asthma management plan (also known as an action plan) to guide patient self-management of exacerbations at home, especially for patients with persistent moderate-to-severe asthma and any patient with a history of severe exacerbations. The better informed a person is about asthma triggers and management of asthma, the less asthma symptoms will interfere with daily activities.

Figure 19 provides an example of an asthma management plan from the National Heart, Lung, and Blood Institute (NHLBI). A copy of asthma management plans in English and Spanish can be downloaded at www.health.rh.gov. Topics and goals usually covered in an asthma management plan are shown in Table 21.

TABLE 21. KEY COMPONENTS AND GOALS OF AN ASTHMA MANAGEMENT PLAN

KEY COMPONENTS	SETTING GOALS
1. Identifying and controlling asthma triggers.	1. Being free from asthma symptoms day and night.
2. Anticipating and preventing asthma attacks.	2. Participating fully in activities.
3. Taking medications as prescribed.	3. Not missing school or work because of asthma symptoms.
4. Following the written, step-by-step plan.	4. Not needing emergency department visits or hospitalizations for asthma.
5. Learning more about new asthma medications and treatments.	5. Learning what things trigger one's asthma and how to control these triggers.

In 2002 and 2005 BRFSS, adults with current asthma were asked if a doctor or other health care professional had ever given them an asthma management plan and were given the following explanation of a plan. *A written management plan for asthma may also be called an 'asthma action plan.' It is a set of instructions from a doctor or other health provider about how to self-manage asthma. It tells when to change the amount or type of medicine, when to call the doctor for advice, and when to go to the emergency room.*

FIGURE 19. ASTHMA MANAGEMENT PLAN

Describes what medicines to use and actions to take.

Asthma Action Plan
A written plan to help you stay in control of your asthma and avoid asthma attacks.

Patient Name: _____ Date: ____/____/____

Healthcare Provider: _____ Phone: _____

Address: _____ City: _____ State: _____

Emergency Contact: _____ Phone: _____

911

GREEN = GO
USE THESE FIRST STEPS TO STAY IN CONTROL

☐ Take your controller medicine every day.
☐ Take your rescue inhaler only when you need it.
☐ Call your doctor if you need your rescue inhaler more often than you should.
☐ If you need your rescue inhaler more often than you should, call your doctor.

If you need your rescue inhaler more often than you should, call your doctor.

YELLOW = CAUTION
USE THESE MEDICINES TO KEEP FROM GETTING WORSE

☐ Take your controller medicine every day.
☐ Take your rescue inhaler only when you need it.
☐ Take your controller medicine every day.
☐ Take your rescue inhaler only when you need it.
☐ Call your doctor if you need your rescue inhaler more often than you should.

If you need your rescue inhaler more often than you should, call your doctor.

RED = STOP
GET HELP FROM A DOCTOR NOW!!!

☐ Take your controller medicine every day.
☐ Take your rescue inhaler only when you need it.
☐ Take your controller medicine every day.
☐ Take your rescue inhaler only when you need it.
☐ Call your doctor if you need your rescue inhaler more often than you should.

If you need your rescue inhaler more often than you should, call your doctor.

Data source: www.cdc.gov/asthma/speakit/slides/slide41.jpg

Only 34% of respondents indicated they had ever received an asthma management plan (Figure 20). However, a significantly higher proportion of adults with current asthma who had one or more routine check-ups for their asthma in the past year reported that their doctor had given them an asthma management plan as compared with persons with asthma who had not had a recent routine check-up for their asthma (41% vs. 23%; Figure 20). We do not show disparities by age, sex, educational level, and income level since very few adults with asthma also reported ever receiving an asthma management plan (n = 154).

PUBLIC HEALTH MESSAGE: Rhode Island adults with asthma may not be seeing their doctor as often as needed for asthma management. All patients with asthma should be monitored by a doctor every one to six months, regardless of how severe their condition is and whether they are experiencing symptoms. Routine check-ups provide an opportunity for a doctor or nurse to develop and update a written asthma management plan with the patient. The asthma management plan provides an opportunity for children and adults with asthma to stay in control and make managing their asthma a part of one's daily routine.

Appropriate Medication Usage: HEDIS® Measure

The National Committee for Quality Assurance (NCQA) has developed a set of standardized performance measures called the Health Plan Employer Data and Information Set (HEDIS®).²⁷ NCQA is a private, non-profit organization dedicated to improving health care quality. HEDIS® is the most widely-used standardized set of performance measures in the managed care industry and is used to reliably compare the performance of accredited health plans. HEDIS® measures address a broad range of health care issues, including asthma. The HEDIS® measure for asthma examines the percentage of health plan members five to 56 years of age with persistent asthma for which long-term control medications were appropriately prescribed (see Table 22). The Rhode Island Department of Health's Asthma Control Program tracks this measure as part of its efforts to improve the quality of asthma care and patient education and to reduce preventable asthma hospitalizations. The program has adopted a target level of 95% compliance on this measure, so higher values on this measure are preferred.

TABLE 22. HEDIS® MEASURE FOR ASTHMA¹

MEASURE

Use of appropriate medications for people with asthma

Ages 5–56 years

CARE, SCREENING, OR TEST NEEDED

Children and adults identified with asthma who received medication for long-term control of asthma (inhaled corticosteroids, cromolyn sodium, nedocromil, leukotriene modifiers, and methylxanthines).

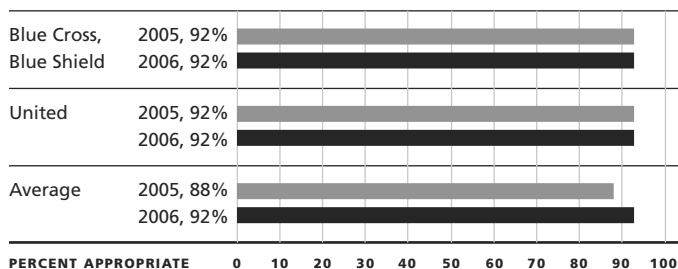
EXCLUSIONS:

Patients with diagnosis of emphysema or COPD

Long-acting beta-2 agonists do not count by themselves. They are considered add-on therapy.

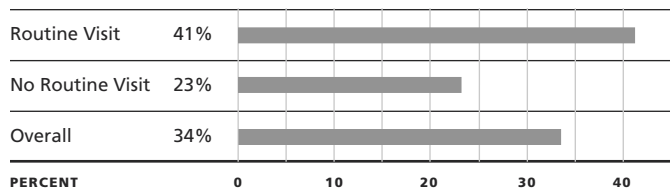
¹ The HEDIS® measure for asthma is the quality-of-asthma-care measure developed by the Health Plan Employer Data Set (HEDIS®).

FIGURE 21. HEDIS® MEASURE: USE OF APPROPRIATE MEDICATIONS FOR PEOPLE (AGES 5–56) WITH ASTHMA ENROLLED IN BLUE CROSS AND BLUE SHIELD OF RHODE ISLAND OR UNITED HEALTHCARE OF NEW ENGLAND, 2005, 2006



Data source: Cryan B. Rhode Island Health Plans' Performance Measure, 2006. Rhode Island Department of Health, Center for Health Data and Analysis and Office of the Health Insurance Commissioner, 2008. Available at: <http://www.health.ri.gov/publications/HealthPlanPerformanceReport2006.pdf>

FIGURE 20. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA WITH AN ASTHMA MANAGEMENT PLAN BY ROUTINE OFFICE VISIT FOR ASTHMA, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2002, 2005



Data Source: 2002, 2005 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

Two health plans, Blue Cross and Blue Shield of Rhode Island (Blue Cross) and United Healthcare of New England (United), provide health coverage to a large majority of Rhode Island residents who are commercially insured. In 2006, Blue Cross, had a market share of 64.8%, and United had a market share of 14.6%. Neighborhood Health Plan of Rhode Island (Neighborhood) is the state's primary

Medicaid health plan. Most Rhode Islanders identified as having persistent asthma received appropriate prescribed medication based on the HEDIS® measure for asthma (see Figures 21 and 22).

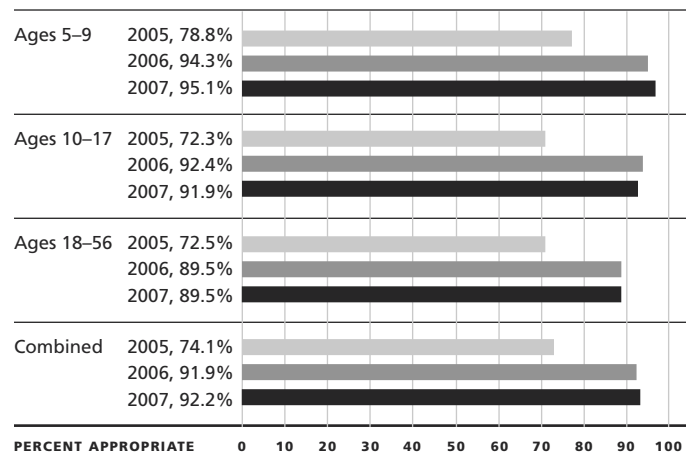
Flu Shots

Influenza, or the flu, is a viral infection that affects the airways. People with asthma have airways that are already somewhat inflamed, and therefore, they are more susceptible to infection. That means it is easier for a person with asthma to catch the flu.

The 2007 National Asthma Education and Prevention Program (NAEPP) *Guidelines for the Diagnosis and Management of Asthma* state that an influenza vaccination during the flu season does not reduce the frequency or severity of an asthma attack during the flu season.²⁹ However, the flu can trigger a severe asthma attack. Therefore, getting a flu shot in early fall, before the flu season begins, is important for someone with asthma. CDC recommends that all individuals 50 years of age and older and individuals who are at an increased risk of complications from influenza, including those with asthma, get an annual influenza (flu) vaccination.³⁰

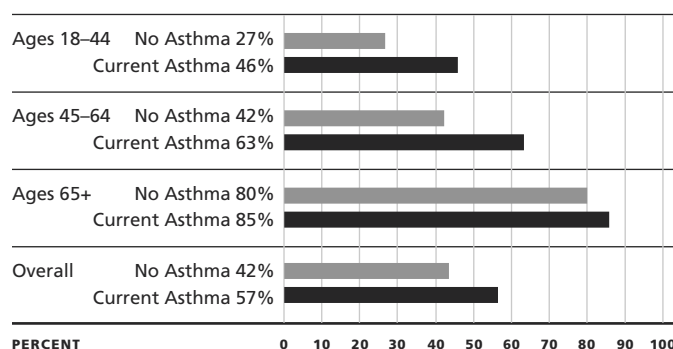
In 2007, 57% of adults (age 18+) with current asthma had a flu vaccine in the last year. This is *significantly higher* than among adults age 18 or older without asthma (42%; Figure 23). In each successive age group, except for adults age 65 and over, the percentage of persons vaccinated for flu in the past year is *significantly higher* among adults with current asthma than adults who do not have asthma (see Figure 23).

FIGURE 22. HEDIS® MEASURE: USE OF APPROPRIATE MEDICATIONS FOR PEOPLE WITH ASTHMA ENROLLED IN NEIGHBORHOOD HEALTH PLAN OF RHODE ISLAND, 2005–2007



Data Source: Neighborhood Health Plan of Rhode Island HEDIS® 2007 Results and CAHP5® 2007 Results. Created on: 8/7/2006 by Erin E. McCombs Printed On: 2/13/2008. HEDIS® is a registered trademark of the National Committee for Quality Assurance (NCQA). Accessed on the web at: www.nhpri.org/matriarch/documents/HEDIS_2007_Results.pdf and reproduced with permission of Neighborhood Health Plan of Rhode Island.

FIGURE 23. PERCENTAGE OF ADULTS VACCINATED FOR FLU IN THE PAST YEAR BY CURRENT ASTHMA STATUS AND BY AGE GROUP, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2007



Data Source: 2007 Rhode Island Behavioral Risk Factor Surveillance System, Rhode Island Department of Health, Center for Health Data and Analysis.

Disparities in Flu Shots

Data from combined 2004–2006 BRFSS confirm the findings shown in Table 23, which indicate that adults age 65 and over with current asthma are *significantly more likely* than younger aged adults with asthma to report having received a recent flu shot. No disparities by sex, socioeconomic status (education and income), or race/ethnicity were observed.

TABLE 23. PERCENTAGE OF ADULTS WITH CURRENT ASTHMA WHO HAD A FLU VACCINE IN THE PAST YEAR BY MEASURES OF DISPARITY, RHODE ISLAND BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS), 2004–2006

		FLU VACCINE SAMPLE AMONG RHODE ISLAND ADULTS WITH CURRENT ASTHMA	
CHARACTERISTICS		UNWEIGHTED SAMPLE ¹	FLU VACCINE PAST YEAR PERCENTAGE (95% CI) ²
Sex	Male	326	43.8 (37.0 – 50.6)
	Female	1009	46.8 (42.8 – 50.8)
Age group	18–64	1036	40.1 (36.2 – 44.0)
	65 and older	283	75.8 (69.9 – 81.6)
Educational level	< 12 years	187	44.0 (33.2 – 54.7)
	HS Diploma or higher	1143	46.1 (42.4 – 49.8)
Household income	< \$25,000 per year	370	49.2 (41.9 – 56.4)
	> \$25,000 per year	769	45.0 (40.7 – 49.4)
Race/ethnicity ³	Minority	195	46.1 (37.2 – 55.0)
	White, non-Hispanic	1120	45.8 (41.9 – 49.6)
Overall		1332	45.8 (42.3 – 49.3)

¹ Sample of respondents with asthma who answered “yes” or “no” in response to the question about having a flu shot in the past year. Of the 1,340 adults with asthma in the combined sample, 8 respondents were missing information on recent flu shot.

² Weighted data.

³ Race/ethnicity: Minorities include persons of Hispanic origin of any race as well as non-Hispanic blacks and non-Hispanics in the “other” race category, which includes Asian Americans, American Indians, and persons of “Two or More Races.” These groups are combined due to their small populations, which prevent meaningful statistical analyses of the groups individually.

Data Source: 2004–2006 Rhode Island Behavioral Risk Factor Surveillance System combined file, Rhode Island Department of Health, Center for Health Data and Analysis.

PUBLIC HEALTH MESSAGE: Rhode Island’s Asthma Control Program and health care communities work closely together to publicize the message that a cold or the flu can trigger an asthma attack. Through patient and provider education, Rhode Islanders are learning what to do if they or a loved one with asthma get the flu and how to prevent infections that trigger asthma.



WHO IS HOSPITALIZED FOR ASTHMA?

Hospitalization rates for asthma are an important population-level marker of asthma severity. With proper treatment, symptom management, and avoidance of triggers, most hospitalizations from asthma can be prevented.³¹

INPATIENT HOSPITALIZATIONS

This section presents information on asthma-related hospitalization rates to determine trends over time and identify population groups most likely to have an asthma-related admission. Records of asthma-related hospital admissions (2000–2007) were extracted from the Rhode Island Hospital Discharge Data. All of Rhode Island's acute care, non-federal hospitals are required to report hospital discharges to the state according to licensure regulations effective January 1, 1989. Although the data are collected for billing purposes, the files include valuable surveillance information, such as patient demographics, primary and additional diagnoses, and charges. Calculations of hospitalization counts and rates are based on the number of hospitalizations, not on the number of individuals hospitalized. An individual may have more than one hospitalization within a reporting period; therefore, the number of individuals with asthma hospitalizations cannot be directly captured in these calculations, because the data are not adjusted for repeated hospital admissions.

Data are based on individuals who were seen at a Rhode Island hospital with a diagnosis of asthma (ICD-9CM codes 493.00–493.92). In 2007, for example, there were 1,547 hospital admissions where asthma was the primary diagnosis. Ninety-four percent of these admissions were from individuals residing in Rhode Island, 4% were residents residing in Massachusetts, 1% were residents residing in Connecticut, and less than 1% resided in another state outside of Rhode Island. Therefore, rates are a slight overestimation of total asthma hospitalizations among Rhode Island residents.

In 2007, there were 1,547 hospital admissions in Rhode Island hospitals where asthma was the primary diagnosis.

Defining an Asthma Hospitalization

Two types of diagnosis codes are given in hospital discharge records: principal diagnosis and underlying diagnosis. A principal diagnosis refers to the primary reason for which the patient was hospitalized. An underlying diagnosis refers to related conditions, which may have contributed to the patient’s hospitalization. The Rhode Island Hospital Discharge Data includes one field for a primary diagnosis and up to 24 additional or underlying diagnoses.

Two mutually exclusive groups of asthma discharges were established: (1) all discharges with a principal diagnosis of asthma (ICD-9-CM diagnosis codes 493.00–493.92) and (2) discharges with a principal diagnosis of a respiratory illness (ICD-9-CM codes 460–492 and 494–496) plus an underlying diagnosis (secondary or tertiary diagnosis) of asthma. Much of our knowledge about hospitalizations for asthma comes from studies that defined an asthma hospitalization as those for which a primary diagnosis of asthma is assigned. Hospitalizations with asthma and respiratory diagnoses, independent of diagnosis order, are especially important in the case of young children where a diagnosis of asthma can be difficult to determine.³²

Calculating an Asthma Hospitalization Rate

A hospitalization for asthma is calculated in one of three ways:

- 1. **Crude Rate.** To calculate a crude rate, the number of hospitalizations in a given year or time period is divided by the size of the population in the same year or time period times a multiplier of 10 (e.g., 100, 1,000, 10,000, 100,000). In this report, crude rates are calculated for specific age groups and are shown as age-specific hospitalization rates.

CRUDE HOSPITALIZATION RATE

Number of hospitalizations for asthma in the population in a specific time period

Number of persons in the population in a specific time period

× 10,000

- 2. **Age-specific hospitalization rate.** An age-specific hospitalization rate is a measure of how common something is in a certain age group. It is calculated as the number of people hospitalized for asthma at a certain age in a certain year, divided by the population of that age group in that year times a multiplier of 10 (e.g., 100, 1,000, 10,000, 100,000). Age-specific rates also can be calculated for population subgroups defined by race, sex, or other demographic characteristics.

AGE-SPECIFIC HOSPITALIZATION RATE

Number of hospitalizations for asthma in a specific age group (e.g. 0–17) in a specific time period

Number of persons in a specific age group (e.g. 0–17) in the population in a specific time period

× 10,000

3. Age-adjusted hospitalization rate.

Almost all diseases or health outcomes occur at different rates in different age groups. Most chronic diseases occur more often among older people. Other outcomes, such as many types of injuries, occur more often among younger people. A community with older individuals will have higher crude rates of chronic diseases than one with younger individuals. A community with a large number of teenagers will have higher crude rates of motor vehicle injuries than a community with more elderly residents. Thus, the age distribution of a community can affect rates of diseases and injuries, hospital, and mortality rates. An age-adjusted rate removes confounding caused by age. Age-adjustment is a statistical procedure accomplished by first multiplying the age-specific rates of disease by age-specific weights. Rates that are based on the same age distribution allow for direct comparison of the change in rates over time by controlling for fluctuations in the age distribution of different population subgroups. Age-adjusted rates can be calculated for population subgroups defined by race, sex, or other demographic characteristics.

AGE-ADJUSTED HOSPITALIZATION RATE

$$\frac{\text{Number of hospitalizations for asthma in a specific age group (e.g. 0-17) in a specific time period}}{\text{Number of persons in a specific age group (e.g. 0-17) in the population in a specific time period}} \times \text{Standard Weight} \times 10,000$$

Trends in Asthma Hospitalization Rates

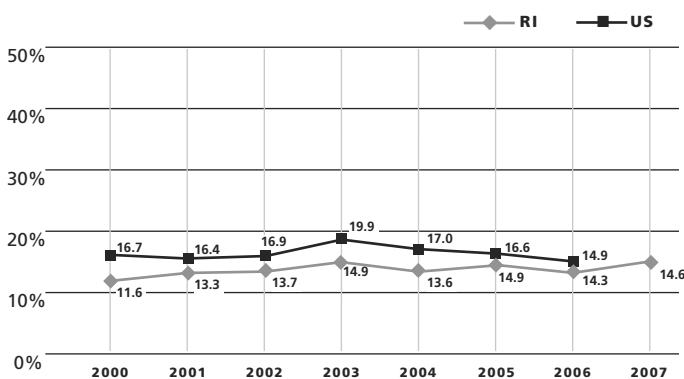
Figure 24 illustrates trends in the age-adjusted hospitalization rate for discharges with asthma as the principal diagnosis. Rates are adjusted to the 2000 US population to remove

differences in the age distribution of the Rhode Island population over time.

Over the last eight years, the rate of asthma hospitalizations has slowly increased from 11.6 per 10,000 Rhode Islanders in 2000 to 14.6 per 10,000 Rhode Islanders in 2007.

These rates, however, remain below national hospitalization rates for asthma.³³

FIGURE 24. AGE-ADJUSTED¹ ASTHMA HOSPITALIZATION RATES² BY PRINCIPAL DIAGNOSIS,³ RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000–2007 AND US NATIONAL HOSPITAL DISCHARGE SURVEY, 2000–2006



¹ Age-adjusted to the year 2000 US standard population.

² All rates are per 10,000 people.

³ The principal diagnosis is defined as a primary (first) discharge diagnosis of asthma (ICD-9-CM codes 493.00–493.92).

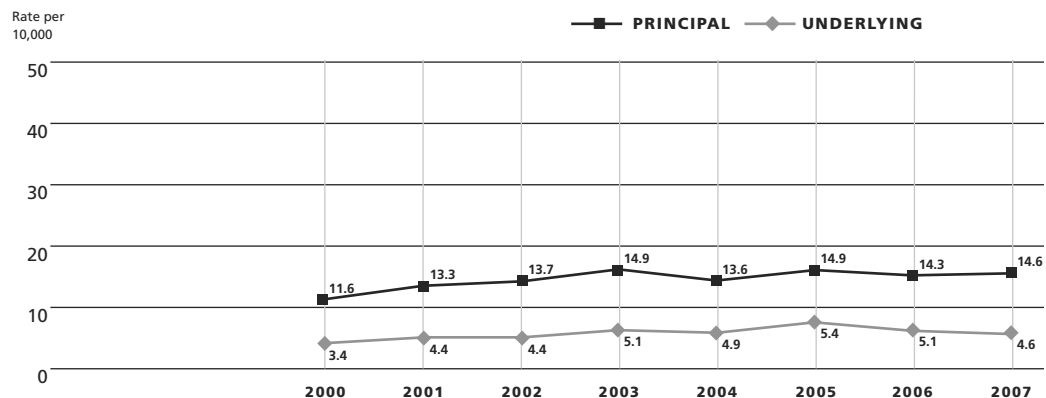
Data Sources: 2000–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis. 2000–2006 National Hospital Discharge Survey, National Center for Health Statistics, Advance Data from Vital and Health Statistics, Centers for Disease Control and Prevention. Available at: <http://www.cdc.gov/nchs/products/pubs/pubd/ad/ad.htm>

Over the last eight years, the rate of asthma hospitalizations has slowly increased from 11.6 per 10,000 Rhode Islanders in 2000 to 14.6 per 10,000 Rhode Islanders in 2007. These rates, however, remain below national hospitalization rates for asthma.

While asthma hospitalization rates in Rhode Island have increased between 2000 and 2007, the reasons for the increase are unknown. The rise in asthma-related hospitalizations in Rhode Island after 2000 may be due to changes in the severity of the disease, changes in billing or coding for asthma, or an increase in environmental factors known as asthma triggers (i.e., air pollution). Another factor may be the criteria used by health plans to approve an inpatient hospitalization. Between 1996 and 2000, health plans in Rhode Island instituted more restrictive criteria for approval of an inpatient hospitalization, which are reflected in lower hospitalization rates for all diseases during this five-year time period.

Figure 25 shows trends in asthma hospitalizations when asthma is the principal diagnosis and when respiratory illnesses are the primary diagnoses and asthma is the underlying diagnosis (secondary or tertiary diagnosis). Overall, asthma hospitalization rates increased from 11.6 per 10,000 residents in 2000 to 14.6 per 10,000 residents in 2007 (3% increase over 8 years). Asthma hospitalization rates did not increase annually, however, falling slightly in 2004 and 2006. When asthma was coded as an underlying diagnosis, the asthma hospitalization rate increased slowly from 2000 to 2003, followed by very modest drops and increases between 2004 and 2007.

FIGURE 25. AGE-ADJUSTED¹ ASTHMA HOSPITALIZATION RATES² BY PRINCIPAL AND UNDERLYING DIAGNOSIS.³ RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000–2007



PRINCIPAL DIAGNOSIS

Discharges (#)	1,214	1,402	1,440	1,570	1,449	1,597	1,526	1,547
Rate	11.6	13.3	13.7	14.9	13.6	14.9	14.3	14.6

UNDERLYING DIAGNOSIS

Discharges (#)	359	461	447	550	524	575	540	491
Rate	3.4	4.4	4.4	5.1	4.9	5.4	5.1	4.6

¹ Age-adjusted to the year 2000 US standard population.

² All rates are per 10,000 people.

³ The principal diagnosis is defined as a primary diagnosis of asthma (ICD-9-CM codes 493.00–493.92).

The underlying diagnosis is defined as a primary (first) diagnosis of respiratory illnesses (ICD-9-CM codes 460.00–496.00, excluding 493.00–493.92) and asthma listed as the secondary or tertiary diagnosis (ICD-9-CM codes 493.00–493.92).

Data Source: 2000–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

In 2006–2007, the most common principal diagnosis when asthma was an underlying diagnosis was pneumonia (ICD-9-CM code 486.00). The best way to protect against pneumococcal disease is through vaccination. Vaccination against pneumococcal disease is recommended for all adults aged 65 and older and for everyone two years of age and older with chronic medical conditions, such as diabetes or heart disease. People with asthma can safely receive a pneumococcal vaccine, but having asthma alone is not a high-risk indication for pneumococcal vaccination.³⁴

PUBLIC HEALTH MESSAGE: Between 2000 and 2007, Rhode Island saw a 3% increase in the age-adjusted hospitalization rate for discharges with a principal diagnosis of asthma (11.6% to 14.6%) and a 1% increase in the age-adjusted hospitalization rate when respiratory illnesses were the principal diagnosis and asthma was the underlying diagnosis (3.4% to 4.6%). During this seven-year period, Rhode Island saw a 1% increase in asthma prevalence among adults (8.5% to 9.9%). Between 2005 and 2007, Rhode Island saw a 2% increase in asthma prevalence among children. Rhode Island's Asthma State Plan outlines multiple initiatives in multiple systems—health care, environmental health, community, and communication—to help people with asthma better manage their disease and reduce the risk of hospitalization for asthma.



Disparities in Age-adjusted Asthma Hospitalization Rates

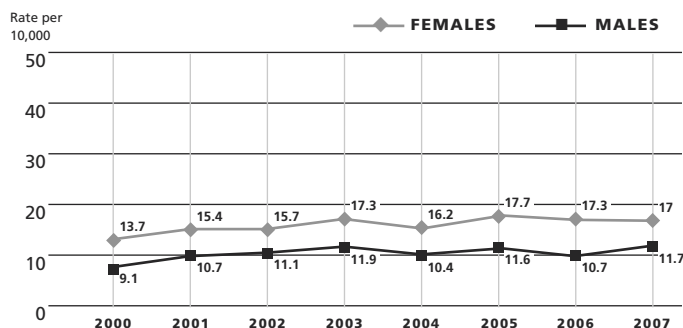
As noted previously, age-adjusted hospitalization rates are calculated to remove the confounding by age. In this report, trends in age-adjusted differences in asthma hospitalization rates are shown for all ages by sex (see Figure 26) and race/ethnicity (see Figure 27).

Sex. Between 2000 and 2007, the age-adjusted asthma hospitalization rates for females slowly rose from 13.7 per 10,000 in 2000 to a high of 17.7 per 10,000 in 2005, before dropping to the current rate of 17.0 per 10,000 in 2007. The age-adjusted asthma hospitalization rate for males rose slowly from 2000 to 2003, before dropping to the current rate of 11.7 per 10,000 males in 2007. Rhode Island females consistently have a higher age-adjusted asthma hospitalization rate than males (see Figure 26).

PUBLIC HEALTH MESSAGE: The most recent data for Rhode Island show that age-adjusted asthma hospitalization rates are nearly 1.5 times higher in females than males. Whether this difference reflects gender differences in prevalence, severity, or treatment is not well understood. Reducing gender disparities in asthma hospitalization rates will require using the most up-to-date available clinical, epidemiologic, and environmental data to better understand the factors that contribute to gender disparities in asthma hospitalization rates and to inform interventions to eliminate these disparities.

Race/ethnicity. Between 2000 and 2007, age-adjusted asthma hospitalization rates among non-Hispanic blacks rose from a low of 29.4 per 10,000 in 2000–2001 to a high of 35.6 per 10,000 in 2006–2007. Age-adjusted asthma hospitalization rates for Hispanics and non-Hispanic whites also rose between 2001–2002 and 2006–2007, but the hospitalization rates for non-Hispanic blacks remained consistently higher than that of Hispanics and non-Hispanic whites (see Figure 27).

FIGURE 26. AGE-ADJUSTED¹ ASTHMA² HOSPITALIZATION RATES³ BY SEX AND YEAR, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000–2007



¹ Age-adjusted to the year 2000 US standard population.

² All rates are per 10,000 people.

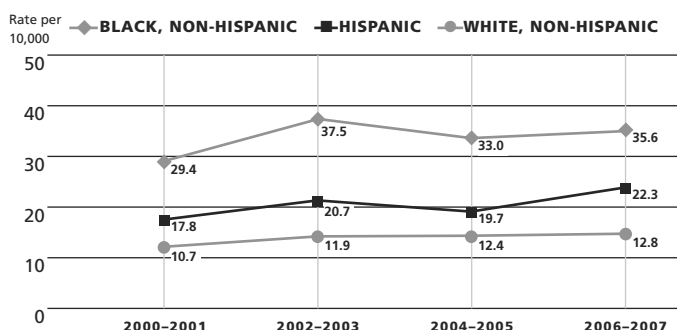
³ The principal diagnosis is defined as a primary diagnosis of asthma (ICD-9-CM codes 493.00–493.92).

The underlying diagnosis is defined as a primary (first) diagnosis of respiratory illnesses (ICD-9-CM codes 460.00–496.00, excluding 493.00–493.92) and asthma listed as the secondary or tertiary diagnosis (ICD-9-CM codes 493.00–493.92).

Data Source: 2000–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

PUBLIC HEALTH MESSAGE: Reducing racial and ethnic disparities in asthma hospitalization rates will require using the most up-to-date available clinical, epidemiologic and environmental data to assess factors that account for race and ethnic disparities in asthma hospitalization rates and to inform interventions to eliminate these disparities. Interventions to reduce race and ethnic disparities in asthma hospitalizations will need to consider that factors contributing to the asthma hospitalization rate in predominately Hispanic communities may be very different from the factors that contribute to that rate in predominately African-American or white communities.

FIGURE 27. AGE-ADJUSTED¹ ASTHMA² HOSPITALIZATION RATES³ BY RACE/ETHNICITY AND YEAR⁴, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000–2007



1 Age-adjusted to the year 2000 US standard population.

2 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00–493.92).

3 All rates are per 10,000 population.

4 Years are combined in two-year intervals to have sufficient cases.

Data Source: 2000–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Disparities in Age-specific Asthma Hospitalization Rates

Data presented in Tables 24 and 25 show that trends in age-adjusted asthma hospitalization rates vary by gender and race. But how common are hospitalizations for asthma in certain age groups and do these rates vary by gender or by race/ethnicity within age groups? To answer these questions, we need to look at age-specific, sex-specific, and race-specific hospital admission rates for asthma. As noted above, these rates are very useful for displaying hospitalization rates *within a population subgroup*. For example, the leveling and declining patterns of age-specific hospital admissions for asthma

found in US studies for children, but not for adults, may reflect improvements in the diagnosis and coding of pediatric asthma cases; there are likely more complex explanations related to co-morbidities in the adult population.

Age group. In Rhode Island, children aged 0 to 4 years have *significantly higher* asthma hospitalization rates than all other age groups. The average age-specific rate for a hospitalization, where asthma was the principal diagnosis, was 48.7 per 10,000 children aged 0 to 4 years as compared with the average age-specific asthma hospitalization rate of 20.1 per 10,000 adults aged 65 and older (see Table 24). Nationally, children under age 5 have exhibited the highest rates of asthma hospitalizations.³⁵

Among adults aged 65 and older, the age-specific asthma hospitalization rate doubled over eight years, from 10.8 in 2000 to 21.3 in 2007 (see Table 24). One particularly difficult challenge in evaluating hospitalizations for asthma in older adults is that several diseases and/or conditions, such as pneumonia, asthma, and chronic obstructive pulmonary disease (COPD), can present with similar clinical features.

Thus, the coding of asthma as the primary or secondary diagnosis on admission may be somewhat arbitrary for an elderly patient.³⁶ In 2007 Rhode Island Hospital Discharge Data, 22% of patients in the 65-and-older population had a principal diagnosis of pneumonia and a secondary diagnosis of asthma. Thus, our findings may underestimate age differences in hospitalization rates between those over age 65 and those under age 65 when asthma admissions are based solely on a principal (first) diagnosis of asthma.

TABLE 24. ANNUAL AND AVERAGE AGE-SPECIFIC ASTHMA¹ HOSPITALIZATION RATES² AND OVERALL AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES,³ RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000–2007

AGE-SPECIFIC ASTHMA HOSPITALIZATION RATES									
	2000	2001	2002	2003	2004	2005	2006	2007	AVERAGE
Ages 0–4	29.9	47.7	52.9	58.0	51.5	49.8	51.6	48.4	48.7
Ages 5–17	10.4	10.8	11.2	11.8	10.2	10.0	7.8	11.5	10.5
Ages 18–44	10.0	8.5	8.7	8.9	7.1	8.2	7.4	7.5	8.3
Ages 45–64	10.6	11.8	11.6	13.1	13.6	15.5	16.0	15.7	13.5
Ages 65+	10.8	17.0	16.3	19.0	19.0	23.8	22.7	21.3	20.1
AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES									
Overall (Age-adjusted)	11.6	13.3	13.7	14.9	13.6	14.9	14.3	14.6	13.9

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00–493.92).

2 All rates are per 10,000 population.

3 Age-adjusted to the year 2000 US standard population

Data Source: 2000–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Sex and age group. Age-specific asthma hospitalization rates by sex confirm previously reported age-related sex differences in asthma hospitalization rates using national data: boys are more likely to be hospitalized for asthma than girls, while women are more likely to be hospitalized for asthma than men.³⁷

As Table 25 indicates, the average age-specific asthma hospitalization rate in boys was 1.5 times the rate of the average age-specific asthma hospitalization rate in girls (24.5 per 10,000 for boys vs. 16.0 per 10,000 for girls). In contrast, the average age-specific asthma hospitalization rate for women aged 18 to 44 was 2.5 times the rate of the average age-specific asthma hospitalization rate in men aged 18 to 44 (11.8 per 10,000 for women vs. 4.7 per 10,000 for men). Whether sex differences in asthma hospitalization rates reflect differences in prevalence, severity, or treatment has not been established.

TABLE 25. ANNUAL AND AVERAGE AGE-SPECIFIC ASTHMA¹ HOSPITALIZATION RATES² AND OVERALL AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES³ BY SEX AND AGE GROUP, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000–2007

AGE-SPECIFIC ASTHMA HOSPITALIZATION RATES		2000	2001	2002	2003	2004	2005	2006	2007	AVERAGE
Female	age 0–17	11.0	15.2	16.6	19.0	17.3	16.8	15.3	16.4	16.0
	age 18–44	13.7	12.2	12.2	12.7	10.6	11.7	10.4	11.0	11.8
	age 45–64	16.1	17.4	17.3	19.5	20.3	21.9	24.5	21.6	19.8
	age 65+	15.0	22.9	21.7	24.5	24.6	30.6	29.9	28.3	24.7
Male	age 0–17	19.6	25.1	26.8	28.0	24.2	23.7	22.9	25.7	24.5
	age 18–44	6.2	4.8	5.1	4.9	3.6	4.6	4.3	4.0	4.7
	age 45–64	4.8	5.8	5.4	6.3	6.6	8.8	7.0	9.3	6.7
	age 65+	4.3	8.2	8.0	10.7	10.6	13.7	11.9	11.0	9.8
AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES		2000	2001	2002	2003	2004	2005	2006	2007	AVERAGE
Overall (Age-adjusted)		11.6	13.3	13.7	14.9	13.6	14.9	14.3	14.6	13.9

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00–493.92).

2 All rates are per 10,000 population.

3 Age-adjusted to the year 2000 US standard population

Data Source: 2000–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.



Race and age group. One critical insight into health care quality is provided by racial and ethnic disparities in hospitalization rates for asthma. In Rhode Island, the age-specific asthma hospitalization rate was higher for non-Hispanic black children than non-Hispanic white children or Hispanic children. The average seven-year (2001–2007) pediatric age-specific asthma hospitalization rate for non-Hispanic black children was 39.8 per 10,000 compared to 27.1 per 10,000 for Hispanic children and 17.0 per 10,000 for non-Hispanic white children (see Table 26).

TABLE 26. ANNUAL AND AVERAGE AGE-SPECIFIC PEDIATRIC ASTHMA¹ HOSPITALIZATION RATES² BY RACE, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2001–2007³

AGE-SPECIFIC PEDIATRIC ASTHMA HOSPITALIZATION RATES		2001	2002	2003	2004	2005	2006	2007	AVERAGE
Children age 0–17	White, non-Hispanic	16.9	18.1	19.1	17.5	16.4	14.8	16.4	17.0
	Black, non-Hispanic	37.0	43.3	39.4	39.6	33.7	43.8	42.0	39.8
	Hispanic	22.3	27.8	31.1	27.2	27.5	23.2	29.8	27.1

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00–493.92).

2 All rates are per 10,000 population.

3 Data for 2000 are not shown because less than 50 children hospitalized for asthma were non-Hispanic black or Hispanic.

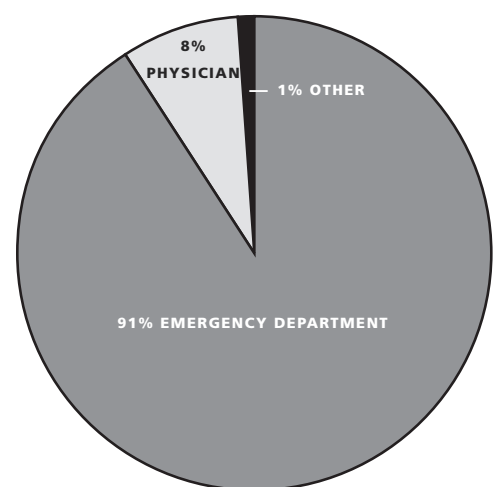
Data Source: 2001–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Not shown in Table 26 are comparisons of age-specific asthma hospitalization rates by race/ethnicity among adults. These comparisons are less precise because the number of asthma hospitalizations among non-Hispanic black adults was less than 50 in six of the eight calendar years between 2000 and 2007. National Hospital Discharge Survey data for the US show that blacks are 3.8 times more likely to be admitted for pediatric asthma and 3.0 times more likely to be admitted for adult asthma, as compared with non-Hispanic whites. However, Hispanics have the highest rate of hospitalization for asthma among patients ages 65 and older based on national data.³⁸ Racial and ethnic differences in asthma hospitalization rates may signal disparities in the quality of ambulatory care, as well as disparities in adequate health care insurance and access to timely and effective treatment for asthma.

Asthma Hospitalizations by Admission Type

In Rhode Island, the most common source of admission for an inpatient hospital stay for asthma is the ED (see Figure 28). About 89% of admissions for pediatric asthma and 92% of admissions for adult asthma were through the ED (data not shown). A small percentage of hospitalizations for adult and pediatric asthma were by physician referral (7.5%). Other sources of referrals included health maintenance organizations, clinics, and transfers from other hospitals.

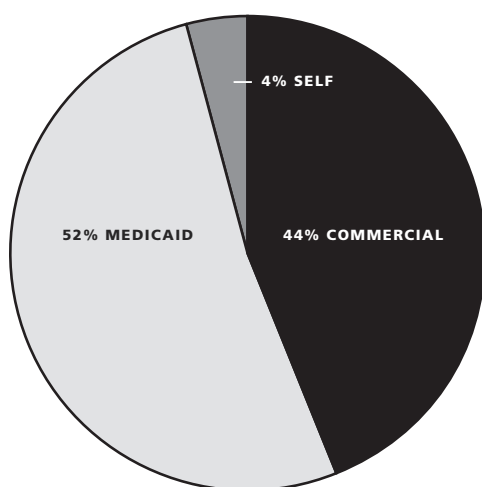
FIGURE 28. SOURCE OF ADMISSION FOR ASTHMA HOSPITALIZATIONS¹, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2007



1 Asthma listed as the principal diagnosis (ICD-9-CM 493.00–493.92)

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

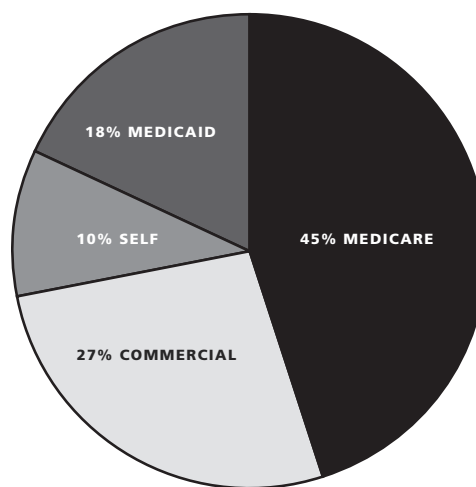
FIGURE 29. PRIMARY PAYER FOR ASTHMA HOSPITALIZATIONS AMONG CHILDREN (AGES 0–17), RHODE ISLAND HOSPITAL DISCHARGE DATA, 2007¹



¹ Asthma listed as the principal diagnosis (ICD-9-CM 493.00–493.92).

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

FIGURE 30. PRIMARY PAYER FOR ASTHMA HOSPITALIZATIONS AMONG ADULTS (AGES 18+), RHODE ISLAND HOSPITAL DISCHARGE DATA, 2007¹



¹ Asthma listed as the principal diagnosis (ICD-9-CM 493.00–493.92).

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Asthma Hospitalizations by Primary Payer

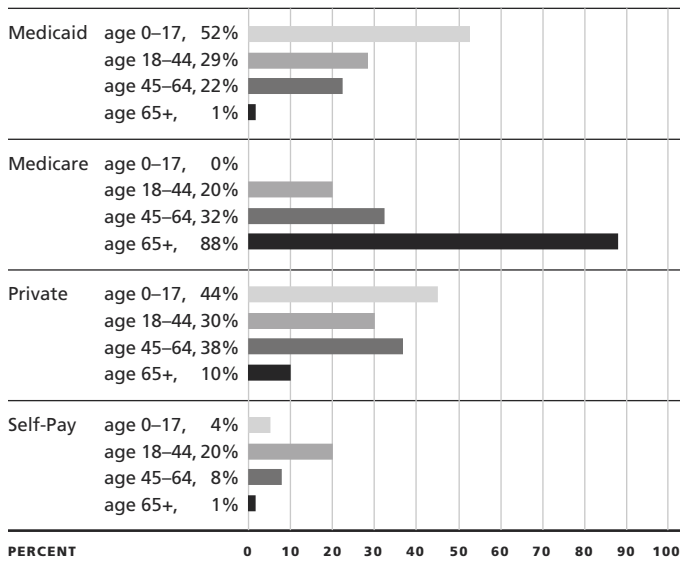
Figures 29 and 30 show the primary payer when asthma is listed as a primary diagnosis. Medicaid was billed for 52% of stays for pediatric asthma discharges (see Figure 29). In the 18-and-older population, 18% of asthma discharges were billed to Medicaid, while Medicare was billed for 45% of asthma-related stays (see Figure 30).

Medicaid-insured patients often have worse asthma status and are less likely to use preventive asthma medications than asthma patients with private (commercial) health care coverage. Besides difficulties in obtaining urgent advice or appointments, Medicaid-insured patients frequently have difficulties finding transportation or obtaining work release, which impedes the use of a primary care office as the principal site of asthma care. Another barrier to care that is specific to Medicaid-insured patients includes lack of continuity in asthma care from health care providers due to breaks in patients' Medicaid coverage. Whether Rhode Island's Medicaid population has a higher incidence of severe acute asthma exacerbations than the commercially insured population cannot be determined using the Rhode Island Hospital Discharge Data file.

Figure 31 displays the findings shown in Figure 30 in more detail. As shown in Figure 30, Medicare was billed for 45% of asthma hospitalizations for patients aged 18 and older. Given that people age 65 and older are the greatest consumers of Medicare dollars, it is not surprising that 88% of asthma hospitalizations were billed to this age group (see Figure 31).

Medicaid-insured patients often have worse asthma status and consume less of preventive asthma medications than asthma patients with private (commercial) health care coverage.

**FIGURE 31. PRIMARY PAYER FOR ASTHMA HOSPITALIZATIONS
BY AGE GROUP, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2007¹**



¹ Asthma listed as the principal diagnosis (ICD-9-CM 493.00-493.92)

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Health Care Resources Used for Asthma Hospitalizations

Between 2005 and 2006, there were approximately 1.9 million asthma-related hospital stays among US adults and 335,000 asthma-related hospitalizations among US children when asthma was listed as the principal reason for hospitalization.^{39,40} Nationally, the average stay for an asthma hospitalization was 4.1 days for adults and 2.2 days for children.^{39,40} Mean charges per stay for hospitalizations principally for asthma were \$5,600 for adults and \$9,100 for children.^{39,40} Costs could be reduced and patients' health and quality of life improved through the use of clinic-based education, in-home education, and environmental interventions.

Rhode Island data on average length of stay, average charges per hospitalization, and total charges for asthma (principal diagnosis only) by age, sex, race/ethnicity and payer type are illustrated in Table 27. In 2006–2007, there were a total of 3,073 hospitalizations in Rhode Island for which asthma was the principal diagnosis. About one-third of the discharges were for pediatric asthma (n=949; 31%).

In Rhode Island, the average stay for a hospitalization for asthma is about two days for children and three days for adults. Average charges per hospitalization for asthma are approximately \$7,840 for children and \$12,977 for adults. In 2006–2007, total charges attributable to asthma were \$35 million (see Table 27)—an estimated \$17 million in 2006 and \$18 million in 2007 (data not shown).

Average length of stay and average charges per hospitalization for childhood asthma varies little by age group. However, children aged 0 to 4 have the highest number of hospitalizations and the highest total charges for asthma as compared with all other children. Total hospital charges for asthma are almost six times greater for children aged 0 to 4 than children aged 12 to 17 (see Table 27).

Among Rhode Island adults, average length of stay and average charges per hospitalization for asthma varies little by sociodemographic characteristics. However, among adults, women and non-Hispanic whites have the highest number of hospitalizations for asthma and incur the highest total charges attributable to asthma—about \$21 million for each demographic group (see Table 27).

TABLE 27. NUMBER OF ASTHMA HOSPITALIZATIONS,¹ AVERAGE LENGTH OF STAY, AVERAGE CHARGE PER ASTHMA HOSPITALIZATION, AND TOTAL ASTHMA HOSPITALIZATION CHARGES BY PATIENT CHARACTERISTICS, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2006–2007

CHARACTERISTIC AT ADMISSION		ASTHMA HOSPITALIZATIONS (NUMBER)	AVERAGE STAY (DAYS)	AVERAGE CHARGES (\$)	TOTAL CHARGES (\$)
All events		3073	3.3	\$11,391	\$35,002,196
Children – Overall		949	1.8	\$7,840	\$7,439,929
Age	0–4	615	1.8	\$7,816	\$4,806,694
	5–11	236	1.7	\$7,682	\$1,812,934
	12–17	98	1.9	\$8,371	\$820,301
Sex	Male	585	1.8	\$8,109	\$4,743,663
	Female	364	1.8	\$7,408	\$2,696,266
Race	Hispanic	223	1.9	\$8,786	\$1,959,210
	Black, non-Hispanic	140	1.8	\$8,091	\$1,132,721
	White, non-Hispanic	506	1.8	\$7,274	\$3,680,480
	Other, non-Hispanic	80	1.8	\$8,343.98	\$347,797
Payer	RltCare/Medicaid	493	1.9	\$8,995	\$4,434,585
	Self-Pay	26	1.4	\$4,563	\$118,628
	Commercial	430	1.7	\$6,714	\$2,886,716
Adults – Overall		2124	3.9	\$12,977	\$27,562,267
Age	18–44	598	3.0	\$10,374	\$6,203,508
	45–64	879	4.0	\$12,942	\$11,375,977
	65+	647	4.7	\$15,430	\$9,982,782
Sex	Male	521	3.6	\$12,661	\$6,596,129
	Female	1603	4.0	\$13,080	\$20,966,138
Race	Hispanic	223	4.0	\$13,378	\$2,983,133
	Black, non-Hispanic	222	3.0	\$11,350	\$2,519,612
	White, non-Hispanic	1605	4.1	\$13,269	\$21,295,590
	Other, non-Hispanic	74	3.3	\$10,323	\$463,788
Payer	Medicaid	408	3.8	\$12,109	\$4,940,475
	Self-Pay	192	2.9	\$9,569	\$1,837,102
	Medicare	964	4.3	\$14,844	\$14,309,521
	Commercial	554	3.7	\$11,589	\$6,420,293
	Unknown	6	–	–	–

– = Not enough cases for analysis.

¹ Asthma listed as the principal diagnosis (ICD-9-CM 493.00–493.92).

Data Source: 2006–2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Asthma Hospitalizations by Geographic Residence

Research has shown that asthma hospitalization rates are positively correlated with a neighborhood’s poverty rate and with the proportion of non-white residents. Asthma hospitalization rates are inversely correlated with residents’ income and educational attainment.¹⁵ Age-specific and age-adjusted asthma hospitalization rates comparing the city of Providence and Rhode Island’s core cities with the rest of the state are shown in Table 28. Data are limited to the year 2000, because population estimates by city and town are available only in the decennial years.

There are large disparities in asthma hospitalizations between those who live in the city of Providence and those who live in the rest of the state. The age-adjusted asthma hospitalization rate for Providence is nearly twice that for the state as a whole (Providence: 18.9 per 10,000 vs. Rhode Island: 10.6 per 10,000).

A similar pattern is observed for age-specific asthma hospitalization rates by geographic residence. In each age group, the age-specific asthma hospitalization rate is nearly two times higher in Providence than for the state. As stated previously, Providence is the most populous city in the state. It has the

There are large disparities in asthma hospitalizations between those who live in the city of Providence and those who live in the rest of the state. The age-adjusted asthma hospitalization rate for Providence is nearly twice that for the state as a whole.

highest percentage of minority residents, with non-Hispanic whites comprising less than half (45.8%) of the population,⁴¹ and a poverty rate that is among the ten highest for US cities with populations over 100,000 (>30%).³

Not surprisingly, residents in Rhode Island’s core cities also have hospitalization rates for asthma that are higher than those for the state as a whole. As noted previously, Rhode Island defines a core city as any city where the child poverty level is greater than 15%, according to the 2000

Census. These cities include: Central Falls, Newport, Pawtucket, Providence, West Warwick, and Woonsocket. Core city residents are much more likely to be uninsured than non-core city residents. In 2001, 12.3% of core city residents were uninsured as compared with 5.7% of residents living in non-core cities.¹⁰

TABLE 28. AGE-SPECIFIC ASTHMA¹ HOSPITALIZATION RATES² AND OVERALL AGE-ADJUSTED ASTHMA HOSPITALIZATION RATES³ BY GEOGRAPHIC RESIDENCE, RHODE ISLAND HOSPITAL DISCHARGE DATA, 2000

GEOGRAPHIC RESIDENCE		2000
State	Age 0–17	11.6
	Age 18–64	10.3
	Age 65+	10.9
	Overall – Age-Adjusted	10.6
Providence	Age 0–17	23.0
	Age 18–64	17.4
	Age 65+	19.7
	Overall – Age-Adjusted	18.9
Core Cities	Age 0–17	22.1
	Age 18–64	14.2
	Age 65+	13.9
	Overall – Age-Adjusted	16.2

1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00–493.92)
2 All rates are per 10,000 population.
3 Age-adjusted to the year 2000 US standard population

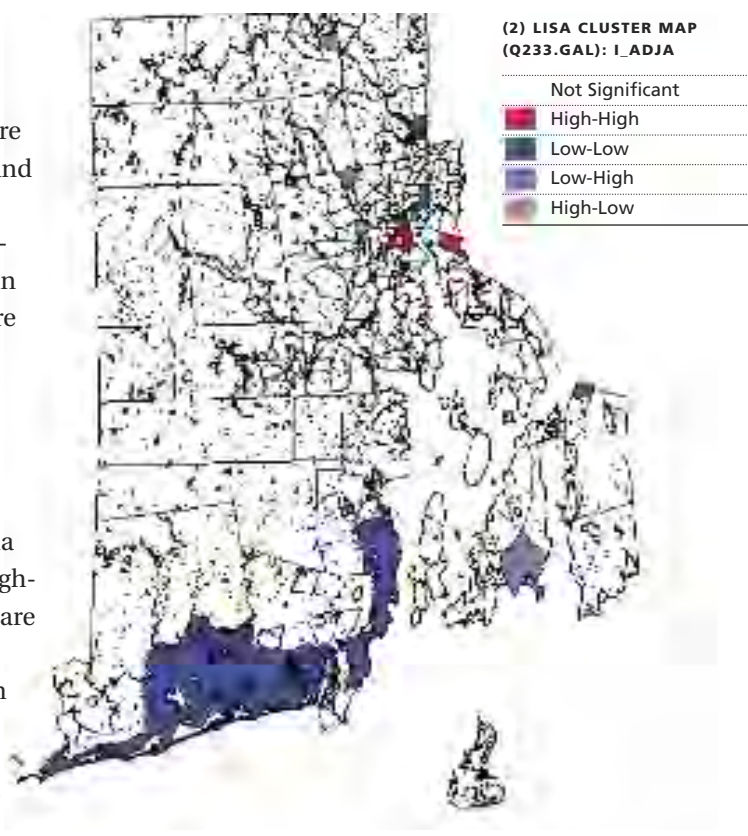
Data Source: 2000 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Asthma Hot Spots

Cluster analysis is an analytical strategy for identifying geographical areas with elevated asthma rates. These areas are called asthma “hot spots.” The results displayed in Figure 32 show that there are statistically significant clusters of high and low hospitalizations for asthma among Rhode Island children. Most of the high-high clusters or asthma “hot spots” are in the Providence County. Colored areas are defined as follows:

- Red: High-high areas marked in red have higher than average asthma hospitalization rates and have adjoining areas or “neighbors” that also have, on average, higher asthma hospitalization rates. Most of the high-high clusters or asthma “hot spots” are in the Providence County.
- Dark Blue: Low-low areas marked in dark blue have lower than average asthma hospitalization rates and have adjoining areas or “neighbors” that also have, on average, low asthma hospitalization rates.
- Light blue: Low-high areas marked in light blue mean that one area has a low pediatric asthma hospitalization rate while adjoining areas or “neighbors” have high pediatric asthma hospitalization rates.
- Pink: High-low areas marked in pink mean that one area has a high pediatric asthma hospitalization rate while adjoining areas or “neighbors” have low pediatric asthma hospitalization rates.

FIGURE 32. CLUSTER MAP OF AGE-ADJUSTED PEDIATRIC ASTHMA HOSPITALIZATIONS IN RHODE ISLAND, 2001–2005



Data sources: Rhode Island Geographic Information System (Census – level shapefile). Rhode Island Department of Health, Center for Health Data and Analysis. Rhode Island Hospital Discharge Data (pediatric asthma admission events)

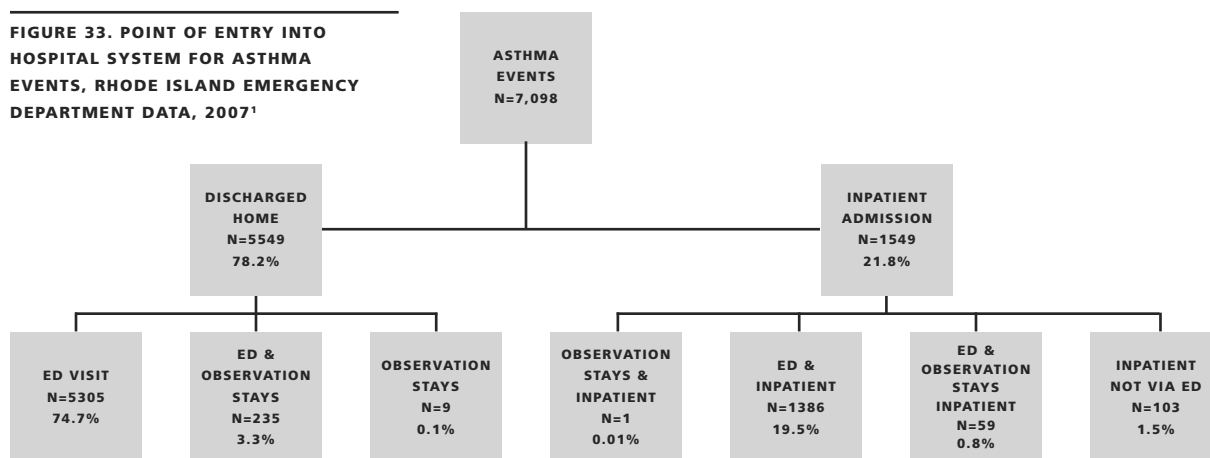
PUBLIC HEALTH MESSAGE: Medicaid incurred the highest charges for asthma hospitalizations for children in Rhode Island, covering nearly \$4.5 million in care during a two-year period. Medicare and Medicaid incurred nearly \$20 million in hospitalization charges for Rhode Island adults with a primary diagnosis of asthma. The *Asthma State Plan* outlines key initiatives that will help reduce these significant costs by increasing emphasis on better disease management and secondary prevention.

EMERGENCY DEPARTMENT VISITS

Records of asthma-related ED visits (2005–2007) were extracted from the Rhode Island ED and Observation Data. The data are collected through a system of hospital-based reporting tools established by regulations promulgated by the Rhode Island Department of Health under its licensure authority, which requires hospitals to report patient-level data on all ED visits and observation stays.

Figure 33 shows the point of entry into the hospital system for asthma events, where asthma was the primary diagnosis. In 2007, the point of entry into the health care system for most asthma events was through an ED visit with the patient discharged home (78%, with or without observation). For 22% of the asthma events, the point of entry into the health care system was through the ED with an inpatient admission. Government, health care insurance plans, providers, and community groups are developing a variety of proposals for health care reform. Monitoring the point of entry into the hospital system for asthma events is critical for discharge planning and for expanding and/or strengthening resources available in local communities to help patients with asthma manage their disease in an outpatient setting.

FIGURE 33. POINT OF ENTRY INTO HOSPITAL SYSTEM FOR ASTHMA EVENTS, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2007¹



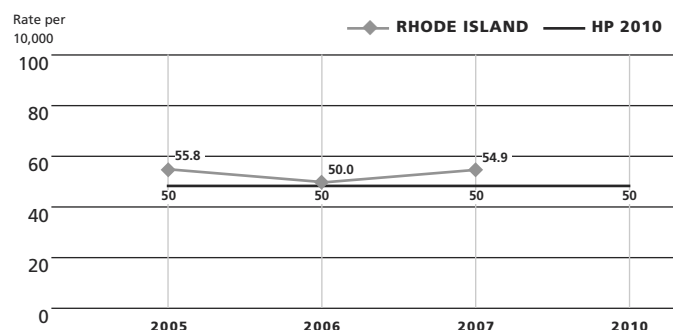
¹Asthma listed as the principal diagnosis (ICD-9-CM 493.00–493.92)

Data Source: 2007 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Trends in Emergency Department Visits

Since Rhode Island began surveillance for ED visits in 2005, asthma-related ED rates have remained fairly constant at approximately 50–55 visits per 10,000 individuals per year. Asthma ED visit rates for all ages are only slightly higher than the Healthy People 2010 target goal of 50.0 per 10,000 individuals for asthma ED visits for ages 5–64 (see Figure 34).

FIGURE 34. AGE-ADJUSTED¹ ASTHMA EMERGENCY DEPARTMENT (ED) VISIT RATES² BY PRINCIPAL DIAGNOSIS³, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2005–2007 AND HEALTHY PEOPLE 2010



¹ Age-adjusted to the year 2000 US standard population.

² All rates are per 10,000 population.

³ The principal diagnosis is defined as a primary (first) discharge diagnosis of asthma (ICD-9-CM codes 493.00–493.92).

Data Sources: 2005–2007 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis and National Center for Health Statistics, Focus Area 24: Respiratory Diseases Progress Review, May 22, 2008. http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa24_2.ppt

Disparities in Emergency Department Visits

Identifying population groups that have a higher prevalence of asthma and also have increased rates of hospitalizations and ED usage helps direct resources to assist those most likely to bear the burden of asthma. Here we ask the questions: *How common are emergency department visits for asthma and do these rates vary by age and sex?* To answer these questions, we need to look at age- and sex-specific rates for asthma ED visits. As noted above, these rates are very useful for displaying hospitalization rates within a population subgroup.

Sex and age group. The age- and sex-specific asthma ED visit rates in Rhode Island show that the use of the emergency room for asthma differs for males and females (see Table 29). Among children younger than 5, boys are more likely to have an ED visit for asthma than girls. In middle childhood and early adolescence, gender differences in ED visit rates are modest, with rates among boys aged 5 to 17 slightly higher than those for girls in the 5-to-17-year-old age group. Among adults, females are more likely than males to have an ED visit for asthma. Interestingly, some research has suggested that females are more likely to present in the ED for an acute asthma, while males are more likely to present with more severe disease.⁴²

TABLE 29. ANNUAL AND AVERAGE AGE-SPECIFIC ASTHMA¹ EMERGENCY DEPARTMENT (ED) VISIT RATES² AND OVERALL AGE-ADJUSTED ASTHMA ED VISIT RATES³ BY SEX AND AGE GROUP, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2005–2007⁴

AGE-SPECIFIC ASTHMA ED VISIT RATES

SEX	AGE	2005	2006	2007	AVERAGE
Female	Ages 0–4	102.5	121.5	113.9	112.6
	Ages 5–17	54.2	48.0	58.2	53.5
	Ages 18–44	79.4	67.9	73.9	73.7
	Ages 45–64	47.5	45.7	50.8	48.0
	Ages 65+	21.4	17.5	15.7	18.2
Male	Ages 0–4	184.6	161.5	197.3	181.3
	Ages 5–17	64.3	62.5	67.8	64.9
	Ages 18–44	45.1	39.4	41.2	41.8
	Ages 45–64	22.4	17.4	23.0	20.9
	Ages 65+	15.2	11.4	11.5	12.7

AGE-ADJUSTED ASTHMA ED VISIT RATES

Overall (Age-adjusted)	55.8	50.0	54.9	53.6
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1 Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00–493.92).

2 All rates are per 10,000 population.

3 Age-adjusted to the year 2000 US standard population.

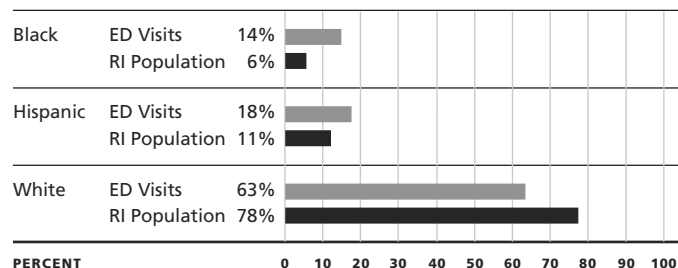
4 The Rhode Island Emergency Department Data are incomplete for 2006. Emergency department data are missing for the first quarter of 2006 (January–March) for Newport Hospital, Rhode Island Hospital, and Miriam Hospital.

Data Source: 2005–2007 Rhode Island Emergency Department Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Race. The most recent national data show that there were 1.8 million visits to EDs for asthma in 2004, or 64 per 10,000 of the population. Nationally, the ED visit rate for blacks was 350% higher than that for whites.⁹

In Rhode Island, non-Hispanic blacks account for 14% of asthma ED visits, yet blacks comprise only 6% of the state population (see Figures 2 and 35). Hispanics account for 18% of ED visits for asthma but are only 11% of the Rhode Island population (see Figures 2 and 35). In contrast, non-Hispanic whites account for 68% of asthma ED visits, but are 78% of the state population (see Figures 2 and 35). Compared with non-Hispanic whites, non-Hispanic blacks and Hispanics have a greater risk of ED visits for asthma, which may be a marker for severe persistent asthma and delay in care. A similar pattern was found when looking at hospital discharges by race/ethnicity where asthma is the primary diagnosis. The most recent Rhode Island Hospital Discharge Data show that non-Hispanic blacks account for 12% of asthma hospitalizations, Hispanics account for 15% of asthma hospitalizations, and non-Hispanic whites account for 68% of hospital admissions for asthma. These findings confirm substantial disparities in the hospitalization rates for asthma by race/ethnicity.

FIGURE 35. PERCENTAGE OF EMERGENCY DEPARTMENT (ED) VISITS BY RACE, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2005–2007¹



¹ The Rhode Island Emergency Department Data are incomplete for 2006. Emergency department data are missing for the first quarter of 2006 (January–March) for Newport Hospital, Rhode Island Hospital, and Miriam Hospital

Data Source: 2005–2007 Rhode Island Emergency Department Data and US Census Bureau State and County QuickFacts, Rhode Island 2006. Available at: <http://quickfacts.census.gov/qfd/states/44000.html> and Henry J. Kaiser Family Foundation State Health Facts. Available at: <http://www.statehealthfacts.org/profileind.jsp?cat=9&sub=106&rgn=41>

Emergency Department Visits and Costs

In 2007, there were 6,995 ED visits in Rhode Island for which asthma was the principal diagnosis (see Figure 33). Shown in Table 30 are data on average and total charges for asthma-related ED visits by age, sex, race/ethnicity, and payer type that resulted in a discharge home (n=5305). These charges were nearly \$9 million and accounted for 76% of ED visits. Table 30 does not include ED visits with an observation stay or an inpatient hospitalization (see Figure 33). Total charges for asthma inpatient hospitalizations in 2007 were about \$18 million.

PUBLIC HEALTH MESSAGE: ED visits for asthma result in considerable cost to the healthcare system but are largely preventable. To prevent ED visits for asthma, it is important to reduce delays in receiving asthma care in outpatient settings and provide good asthma care management.

TABLE 30. NUMBER OF ASTHMA EMERGENCY DEPARTMENT (ED) VISITS,^{1,2} AVERAGE CHARGES PER ASTHMA ED VISIT AND TOTAL ASTHMA ED VISIT, CHARGES BY PATIENT CHARACTERISTICS, RHODE ISLAND EMERGENCY DEPARTMENT DATA, 2007

CHARACTERISTIC		ASTHMA ED VISITS ¹ (NUMBER)	AVERAGE CHARGES (\$)	TOTAL CHARGES (\$)
All events		5305	\$1,686	\$8,944,086
Children – Overall		1856	\$1,823	\$3,383,654
Age	0–4	857	\$2,013	\$1,724,948
	5–11	629	\$1,775	\$1,116,446
	12–17	370	\$1,466	\$542,260
Sex	Male	1119	\$1,866	\$2,088,103
	Female	737	\$1,758	\$1,295,551
Race	Hispanic	494	\$2,051	\$1,012,849
	Black	312	\$2,005	\$625,452
	White	919	\$1,652	\$1,517,447
	Other races/unknown	75	–	–
Payer	RlteCare/Medicaid	813	\$1,749	\$1,458,683
	Self-Pay	103	\$1,422	\$195,699
	Commercial	929	\$1,849	\$1,717,687
	Unknown	11	–	–
Adults – Overall		3449	\$1,612	\$5,560,432
Age	18–44	2255	\$1,531	\$3,453,273
	45–64	1013	\$1,688	\$1,709,888
	65+	181	\$2,195	\$397,271
Sex	Male	1164	\$1,623	\$1,887,801
	Female	2285	\$1,607	\$3,672,631
Race	Hispanic	493	\$1,677	\$826,631
	Black	491	\$1,767	\$867,626
	White	2323	\$1,560	\$3,622,574
	Other races/unknown	90	–	–
Payer	Medicaid	813	\$1,686	\$1,370,221
	Self-Pay	893	\$1,475	\$1,316,728
	Medicare	459	\$1,863	\$854,986
	Commercial	1255	\$1,579	\$1,981,501
	Unknown	29	–	–

– = Not enough cases for analysis.

¹ Asthma listed as the principal diagnosis (ICD-9-CM 493.00–493.92).² Emergency department visits exclude events with an observation stay and/or inpatient hospitalization.

Data Source: 2007 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.



WHO DIES FROM ASTHMA?

Asthma-related deaths represent the most extreme consequence of asthma. Many deaths from asthma could be prevented with proper treatment, quality health care, consistent self-management, and a reduction in environmental triggers known to increase the risk of developing asthma and having more severe asthma once the disease develops.

Asthma Deaths

By law, deaths in Rhode Island are reported to the Rhode Island Department of Health's Office of Vital Records. Death certificates are completed by physicians, coroners, funeral directors, or county or city health officers. For all death records, one underlying or primary cause of death and up to 20 contributing causes of death are recorded. Medical codes for reporting the causes of death on the death certificate based on International Classification of Diseases (ICD) ICD-10 coding system.⁴³

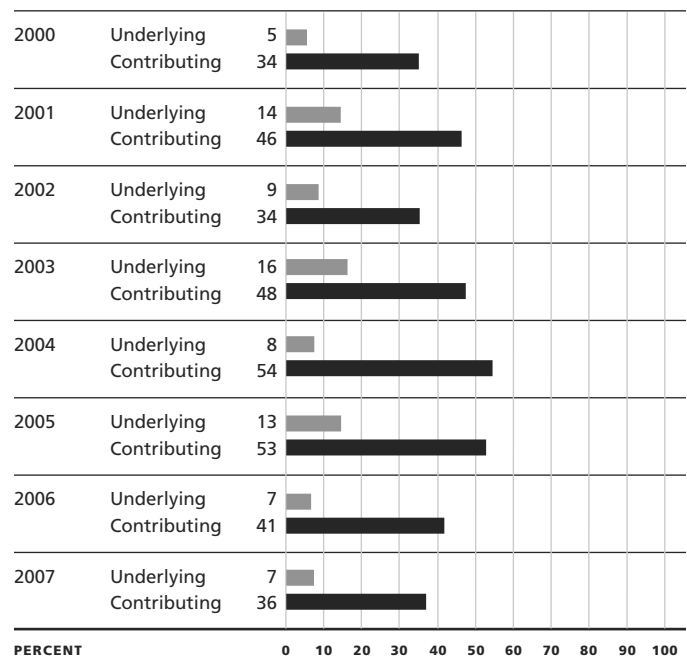
Defining an Asthma Death

Two mutually exclusive groups of asthma deaths were established: (1) deaths where the underlying (principal) cause of death was asthma (ICD-10 codes J45 and J46) and (2) deaths where a disease and/or condition other than asthma was listed as the underlying cause of death and asthma was listed as one of the contributing but not the principal cause of death. The coding for asthma deaths is different from the coding used to identify a hospitalization for asthma. When asthma is identified as the contributing cause of death, the underlying or principal cause of death is not restricted to respiratory diseases.

Number of Asthma Deaths

Between 2000 and 2007, there was an average of 10 deaths per year in Rhode Island for which asthma was the underlying cause (Range: 5 to 16 deaths).

FIGURE 36. COUNTS OF ASTHMA DEATHS¹ BY UNDERLYING AND CONTRIBUTING CAUSES, RHODE ISLAND VITAL RECORDS, 2000–2007



¹ Causes of death were coded with ICD-10 (J45–J46) from 1999–2007.

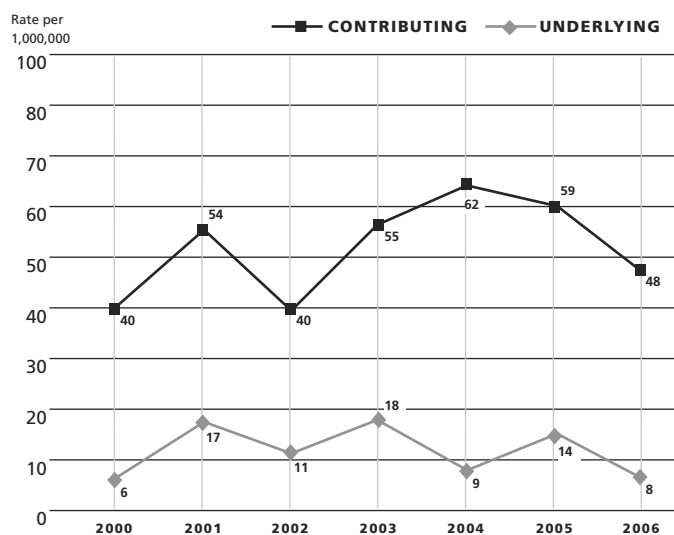
Data Source: 2000–2007 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Additionally, there was an average of 43 deaths per year where asthma was listed as a contributing cause of death (see Figure 36).

Trends in Asthma Deaths

Figure 37 illustrates trends in the age-adjusted mortality rate for which asthma was the underlying or contributing cause of death. Data are shown for adults aged 18. During this period the number of children that died of asthma as the underlying or contributing cause of death was very low. Over the last seven years, the age-adjusted asthma mortality rate by year in Rhode Island has remained low. The average mortality rate where asthma was the underlying cause of death was 11.7 deaths per one million Rhode Island adults aged 18 and older (data not shown). The average mortality rate where asthma was the contributing cause of death was 51.1 deaths per one million Rhode Island adults aged 18 and older (data not shown). Age-adjusted mortality rates for asthma are based on a small number of events and should be interpreted with caution.

FIGURE 37. AGE-ADJUSTED¹ ADULT ASTHMA MORTALITY RATES² BY UNDERLYING AND CONTRIBUTING CAUSE OF DEATH,³ RHODE ISLAND VITAL RECORDS, 2000–2006



ANNUAL AGE-ADJUSTED ASTHMA MORTALITY RATE PER 1,000,000 RI RESIDENTS AGES 18+

	2000	2001	2002	2003	2004	2005	2006
Underlying (#)	5	14	9	16	8	13	7
Rate	6.1	16.5	10.8	17.9	9.3	14.1	8.2
Contributing (#)	34	46	34	48	54	53	41
Rate	39.9	53.7	40.1	54.8	61.6	58.6	48.0

1 All rates are per 1,000,000 Rhode Island residents ages 18+. Deaths from asthma in children are excluded from the calculation of the age-adjusted rate because the number of deaths in any year was less than 5.

2 Age-adjusted to the year 2000 US standard population.

3 Asthma listed as the underlying or contributing cause of death (ICD-10 codes J45 and J46)

Data Source: 2000–2006 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis.

Disparities in Asthma Deaths

In Rhode Island and nationally, adults 65 and over have the highest mortality rates from asthma, whether asthma is the underlying (principal) cause of death or asthma is a contributing cause of death. Between 2000 and 2007, there was an average of eight deaths from asthma in the 65 and over population where asthma was the underlying cause of death (see Table 31) and an average of 30 deaths from asthma among adults 65 years and older where asthma was a contributing cause of death (see Table 32).

Due to the small numbers of deaths due to asthma in children ages 0–17, only counts of asthma deaths in children are displayed in Tables 31 and 32. Age-adjusted mortality rates for asthma for adults should also be interpreted with caution given the small number of events.

TABLE 31. DEATHS ATTRIBUTABLE TO ASTHMA AS THE UNDERLYING (PRINCIPAL) CAUSE OF DEATH¹ AND OVERALL AGE-ADJUSTED ASTHMA MORTALITY RATES² BY AGE GROUP, RHODE ISLAND VITAL RECORDS, 2000–2007

COUNTS OF ASTHMA UNDERLYING CAUSE OF DEATH		2000	2001	2002	2003	2004	2005	2006	2007	AVERAGE
Age	0–17	0	0	0	1	0	1	0	0	0.2
	18–64	3	6	6	9	2	4	2	1	4.1
	65+	2	8	3	6	6	8	5	6	5.5
AGE-ADJUSTED ASTHMA MORTALITY RATES IN RHODE ISLAND RESIDENTS AGES 18 AND OLDER ³										
Overall	(Age-adjusted)	6.1	16.5	10.8	17.9	9.3	14.1	8.2	–	–

Data are statistically unreliable when the number of deaths in a specific age group in a specific year is less than 5.

1 Asthma listed as the underlying cause of death (ICD-10 codes J45 and J46).

2 All rates are per 1,000,000. Standard 2000 US population used for direct age-adjustment.

3 Age-adjusted to the year 2000 US standard population.

Data Source: 2000–2007 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis.

TABLE 32. DEATHS ATTRIBUTABLE TO ASTHMA AS THE CONTRIBUTING CAUSE OF DEATH¹ AND OVERALL AGE-ADJUSTED ASTHMA MORTALITY RATES² BY AGE GROUP, RHODE ISLAND VITAL RECORDS, 2000–2007

COUNTS OF ASTHMA UNDERLYING CAUSE OF DEATH		2000	2001	2002	2003	2004	2005	2006	2007	AVERAGE
Age	0–17	0	0	0	1	1	1	0	0	0.4
	18–64	12	15	15	16	14	17	9	7	13.1
	65+	22	31	19	31	39	35	32	29	29.7
AGE-ADJUSTED ASTHMA MORTALITY RATES IN RHODE ISLAND RESIDENTS AGES 18 AND OLDER ³										
Overall	(Age-adjusted)	39.9	53.7	40.1	54.8	61.6	58.6	48.0	42.2	49.8

Data are statistically unreliable when the number of deaths in a specific age group in a specific year is less than 5.

1 Asthma listed as the underlying cause of death (ICD-10 codes J45 and J46).

2 All rates are per 1,000,000.

3 Age-adjusted to the year 2000 US standard population.

Data Source: 2000–2007 Rhode Island Vital Record Death Data, Rhode Island Department of Health, Center for Health Data and Analysis.

PUBLIC HEALTH MESSAGE: While the asthma mortality rate is relatively low in Rhode Island, interventions should focus on relaying the importance of quality asthma care to ensure good asthma control as an effective means of preventing asthma mortality. The continued collection of mortality data will permit aggregation of data that may help determine if and why certain groups in the population are more likely to die of asthma.



ASTHMA IN VULNERABLE POPULATIONS: MEDICAID BENEFICIARIES

What is Medicaid?

The Medical Assistance Program, also known as “Medicaid” was created in 1965 as Title XIX of the Social Security Act to provide health care services to low-income families. It is an entitlement program jointly administered and financed by federal and state governments. Medicaid pays for medical and health-related services. Eligibility is based on family income and medical need (see Table 33). RItE Care is Rhode Island’s Medicaid Managed Care Program. Individuals eligible for RItE Care include:

- parents of RItE Care eligible children (up to age 18) with income under 185% of the Federal Poverty Level (FPL);
- children under age 19 with family income under 250% of FPL; and
- pregnant women with family income under 350% of FPL.

Rhode Island has one of the most successful Medicaid program in terms of percentage of children enrolled. Income eligibility for Rhode Island’s Medicaid program is shown below.⁴⁴

TABLE 33. INCOME ELIGIBILITY FOR PARENTS APPLYING FOR MEDICAID BY ANNUAL INCOME AS A PERCENT OF FEDERAL POVERTY LEVEL (FPL), RHODE ISLAND AND US, 2008

	MEDICAID AND STATE CHILDREN’S HEALTH INSURANCE PROGRAM (SCHIP)			
	RI % FPL	RI \$ THRESHOLD	US % FPL	US \$ THRESHOLD
Non-working parents	185%	\$31,765	41%	\$6,996
Working parents	191%	\$32,845	63%	\$10,849

Eligibility levels shown as percent of the Federal poverty level (FPL). Currency figures based on FPL for a family of three in 2007: \$17,170 for 48 contiguous states and District of Columbia, \$21,470 for Alaska, \$19,750 for Hawaii.

Data as of January 2008. The income eligibility levels noted may refer to gross or net income depending on the state. “Regular” Medicaid refers to coverage under Medicaid eligibility standards for children in place prior to SCHIP; states receive “regular” Medicaid matching payments as opposed to enhanced SCHIP matching payments for these children.

Data source: Health Coverage for Children and Families in Medicaid and SCHIP: State Efforts Face New Hurdles. Data based on a national survey conducted by the Center on Budget and Policy Priorities for the Kaiser Commission on Medicaid and the Uninsured, January 2008. Available at: <http://www.kff.org/medicaid/7740.cfm>

Why Focus on Asthma in the Medicaid Population?

State Medicaid programs increasingly monitor the quality of care that their beneficiaries with asthma receive and use this information to target quality improvement efforts and to provide incentives for physicians and health plans to achieve quality benchmarks. Of special interest is quality of life for Medicaid beneficiaries with asthma.

Among children under 18 years of age, those insured by Medicaid are nearly twice as likely to have ever been diagnosed with asthma and still have asthma compared to children with private health insurance (13.3% vs. 8.3%).¹⁷ The prevalence of current asthma among adults aged 18 to 64 is nearly three times higher among Medicaid beneficiaries as those with private insurance (16.4% vs. 6.6%). Similarly, among adults age 65 and over, those insured by Medicaid and Medicare have higher percentages of asthma, than those with only Medicare health care coverage (13.4 vs. 6.0%).⁴⁵

About Neighborhood Health Plan of Rhode Island

Neighborhood Health Plan of Rhode Island is a network model health plan serving primarily Medicaid beneficiaries throughout the state of Rhode Island. In 2008, US News Media Group and The National Committee for Quality Assurance (NCQA) released the fourth annual edition of America's Best Health Plans. In 2008 rankings, Neighborhood Health Plan of Rhode Island was ranked one of the top five Medicaid Plans in the country.

Asthma Quality of Life Survey

In 2005, 2006, and 2007, Neighborhood Health Plan of Rhode Island conducted an Asthma Quality of Life Study of their Medicaid beneficiaries. The Asthma Quality of Life Survey was administered using a three-wave mixed (phone and mail) protocol, in both English and Spanish. Table 34 presents a three-year comparisons from selected survey questions.

Readers interested in the study and in need of a comprehensive overview of study results should contact Neighborhood Health Plan's Manager of Clinical Programs at 1-401-459-6127.

Three-year trends (2005–2007):

- **Asthma Management.** There was a *significant increase* in the percentage of respondents with an asthma management plan (2005: 65.9%; 2007: 78.6%)
- **Medications.** There was a *significant increase* in the percentage of respondents using an inhaled quick-relief medicine when they had difficulty breathing. (2005: 89.4%; 2007: 92.5%). Similarly, there was a *significant increase* in the percentage of respondents prescribed every day, long-term asthma control medicines (2005: 71.1%; 2007: 82.3%).
- **Quality of life.** There was a *significant decrease* in the percentage of respondents that reported limitations in social activities because of asthma (2005: 41.3%; 2007: 35.1%).
- **Health care.** There was a *significant increase* in the percentage of respondents that had seen a doctor for their asthma in the past 6 months (2005: 65.9%; 2007: 72.4%). Similarly, there was a *significant increase* in the percentage of respondents satisfied with asthma care (2005: 92.8%; 2007: 96.6%).

TABLE 34. THREE-YEAR TREND COMPARISONS OF THE NEIGHBORHOOD HEALTH PLAN OF RHODE ISLAND, ATTRIBUTES AND RATINGS OF MEMBER SATISFACTION, ASTHMA QUALITY OF LIFE STUDY, 2007

ATTRIBUTE/RATING ITEM	SUMMARY RATES ¹			SIGNIFICANCE TESTING ²	
	2007	2006	2005	2006–2007	2005–2007
CONTROLLING YOUR ASTHMA					
1. Confidence in ability to control asthma	77.5%	78.0%	76.6%	Not Sig.	Not Sig.
2. Do you have a written Asthma Action Plan (AAP)?	78.6%	69.3%	65.9%	Sig. Increase	Sig. Increase
2a. Do you use the AAP when you have symptoms?	95.3%	96.1%	96.8%	Not Sig.	Not Sig.
3. Has your doctor told you to use a peak flow meter?	53.3%	52.9%	49.7%	Not Sig.	Not Sig.
MEDICATION					
5. Do you use an inhaled quick-relief medicine when you have difficulty breathing?	92.5%	93.0%	89.4%	Not Sig.	Sig. Increase
6. Has your doctor prescribed every day, long-term asthma control medicines?	82.3%	79.8%	71.1%	Not Sig.	Sig. Increase
DAILY EFFECTS					
7a. How often does your asthma limit your ability to do your daily activities/attend school?	39.4%	42.3%	38.1%	Not Sig.	Not Sig.
7b. How often does your asthma limit you from sleeping through the night?	26.2%	33.9%	30.9%	Sig. Decrease	Sig. Decrease
7c. How often does your asthma limit you from exercise/physical activity?	26.3%	29.4%	27.1%	Not Sig.	Not Sig.
7d. How often does your asthma limit you from engaging in social activities/playing with friends?	35.1%	43.0%	41.3%	Sig. Decrease	Sig. Decrease
HEALTH CARE					
8. Have you seen your doctor for an asthma condition in the last 6 months?	72.4%	68.0%	65.9%	Not sig	Sig. Increase
8a. Satisfaction with the health care you have received for your asthma?	96.6%	94.8%	92.8%	Not Sig.	Sig. Increase
9. Do you or anyone in your household smoke tobacco products in your home?	85.1%	83.8%	79.0%	Not Sig.	Sig. Increase

¹ Summary Rates are defined by TMG and are used to facilitate comparisons.

² "Sig. Decrease" denotes the result that would be found if a hypothesis test were conducted to determine if the percentage is lower. "Sig. Increase" denotes the result that would be found if a hypothesis test were conducted to determine if the percentage is higher. "Unable to test" denotes that there was insufficient sample size to conduct the statistical test.

Data source: Neighborhood Health Plan of Rhode Island, Asthma Quality of Life Survey Report, 2007

DISCUSSION

This report describes recent trends in asthma prevalence, morbidity, and mortality in Rhode Island. In 2007, 11% of children and 10% of adults currently had asthma. Asthma rates in the New England region, including Rhode Island, remain consistently higher for both adults and children than in the rest of the country.

Why asthma disproportionately impacts Rhode Island and surrounding New England states is unknown. It is possible that environmental conditions that contribute to asthma's onset are more highly concentrated in Rhode Island and other northeastern states as compared with other parts of the country. Further study is needed on the possible role of environmental factors in relation to the development of asthma and exacerbation of the disease once someone has asthma.

Certain co-morbidities and lifestyle behaviors, notably obesity and smoking, also increase the risk of having more severe asthma once the disease develops. In this report, adults who were obese were nearly twice as likely to have asthma compared to adults who were not obese (16% vs. 9%). Adults who currently smoked also were significantly more likely to have asthma than adults who were not current smokers (13% vs. 10%). Although the relationship between exposure to tobacco smoke and risk of asthma is well-established, this is less true for the relationship between obesity and asthma.

Asthma can have profoundly disruptive effects on quality of life and the reported impact of asthma is often greatest on those with low incomes. In Rhode Island, low-income adults were more likely than higher-income adults to report that they had asthma symptoms most days of the week or daily and to use rescue medications to stop an asthma attack five or more times in the past 30 days.

Over the last eight years (2001–2007), the rate of asthma hospitalizations in Rhode Island has slowly increased from 11.6 per 10,000 Rhode Islanders in 2000 to 14.6 per 10,000 Rhode Islanders in 2007. But significant progress is being made. Rhode Island's hospitalization rate for asthma remains below national rates. Since Rhode Island began surveillance for ED visits in 2005, asthma-related ED visit rates for all ages have risen only slightly higher than the Healthy People 2010 target goal of 50.0 per 10,000 individuals for asthma ED visits for ages 5 to 64. Still, asthma-specific hospitalization and ED visit rates disproportionately impact the state's most vulnerable citizens.



The most recent Rhode Island data (2005–2007) show that blacks accounted for 12% of asthma hospitalizations and 14% of asthma ED visits, yet this group comprises only 6% of the state population. Hispanics accounted for 15% of asthma hospitalizations and 18% of ED visits for asthma but are only 11% of the Rhode Island population. These findings confirm substantial disparities in the ED rates for asthma by race/ethnicity.

There are large disparities in asthma hospitalizations based on geographic residence. The age-adjusted asthma hospitalization rate for the city of Providence is nearly twice that for the state as a whole (Providence: 18.9 per 10,000 vs. Rhode Island: 10.6 per 10,000). Providence is the most populous city in Rhode Island with the highest percentage of minority residents and a poverty rate that is among the ten highest for US cities with populations over 100,000 (>30%).

Asthma is also a costly disease. In 2007, total charges attributable to ED visits for asthma for patients discharged home without an observation stay or inpatient admission were over \$8 million and total charges for asthma inpatient hospitalizations in 2007 were even higher—about \$18 million.

This report serves as a foundation for prioritizing and tailoring prevention and intervention efforts to reduce the burden of asthma in Rhode Island. In cooperation with CDC, the Rhode Island Asthma Control Program will continue to work with stakeholders from around the state to create and implement strategies for reducing the burden of asthma in Rhode Island. As part of this effort, Rhode Island will continue to strive to improve surveillance of asthma by adding new data sets, as available, to provide a comprehensive picture of asthma in the state.

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